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ABSTRACT

These 23 learning guides are self-instructional packets for 23 tasks identified as essential for performance on an entry-level job in welding. Each guide is based on a terminal performance objective (task) and 1-4 enabling objectives. For each enabling objective, some or all of these materials may be presented: learning steps (outline of student activities) with necessary resources/materials cited, instruction sheet(s), and self-check with answer key. A performance test and/or a written test (with answer key) concludes each guide. Tasks covered in these guides include drilling, cutting, shearing, and punching metal; wire brushing; welding outside corner joints; butt joints, single and multiple pass lap joints, 3 pass and 6 pass "Tee" joints, and vee-bend test plates in horizontal, vertical, and overhead positions; welding with low hydrogen electrodes; finishing metal surfaces; assembling tig and mig torches and preparing to weld with them; welding mild steel, stainless steel, and aluminum with tig equipment; and welding mild steel with mig equipment. (YLB)

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ED210425

Welding

STUDENT LEARNING GUIDES

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IN-9943-B-01

WELDING

A STUDENT LEARNING GUIDE

TASK:	Drill Metal Using Power Drilling Equipment
DUTY:	Operating Auxiliary Equipment and Tools

PURPOSE:

To drill holes in a welding job, you must know how to use a drill press and portable electric drill. This Learning Guide will assist you in operating both a drill press and a portable electric drill.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	B	01	

REVISED:				

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: a drill press, portable electric drill, drill bit and metal,

YOU WILL: drill holes in metal.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 10.

NOTE:

IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Identify steps in operating a drill press and portable electric drill.
2. Operate a drill press and portable electric drill.

DEPT.	PROG.	DUTY	TASK
IN	9943	B	01

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ENABLING OBJECTIVE NO. 1

RVTC

Identify steps in operating a drill press and portable electric drill.

LEARNING STEPS

1. Read Resource No. 1 for operation methods of a drill press and a protable electric drill.
2. Read Resource No. 2 to identify safety precautions and steps in operating a drill press.
3. Read Resource No. 3 to identify safety precautions and steps in operating a portable electric drill.
4. When completed, check your knowledge using the Self-Check.
5. Go on to Enabling Objective No. 2.

RESOURCES

1. Text: General Shop; Unit 44, pages 134-136.
2. Rockwell Instruction Manual for a 15" Drill Press
3. Black and Decker Owners Manual for 1/4" and 3/8" Drills
4. Self-Check enclosed.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	B	01	1

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SELF-CHECK

RVTC

Directions

Check your knowledge by answering the items below on a separate sheet of paper.

1. The drill press and portable electric drill both have a _____ to secure the drill bit.
2. The most common portable electric drill chucks will take up to _____ inch drill bit.
3. Use a block of _____ for a back-up when drilling all the way through.
4. For safety, use _____ or a _____ _____ when working with a drill.

Now check your answers with the Answer Key.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	01	1

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SELF-CHECK

RVTC

Answer Key

1. chuck or chuck key
2. 1/4
3. wood
4. goggles, face shield

All of your answers should agree with the answers in the Answer Key. If you missed any, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	01	1

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ENABLING OBJECTIVE NO. 2

RVTC

Operate a drill press and portable electric drill.

LEARNING STEPS

1. Read Resource No. 1 to identify precautions to practice while operating equipment.
2. Read Resource No. 2 to specify steps in operating the portable electric drill.
3. See instructor for your job of operating the drill press and portable electric drill.
4. Operate the drill press and portable electric drill by following the steps in Resource No. 2.
5. When completed, evaluate your work using the Self-Check.
6. Have instructor check your drilled metal.
7. When you think you can perform this task, take the Performance Test.

RESOURCES

1. Instruction Sheet enclosed, Safety Rules
2. Instruction Sheet enclosed, Operating the Portable Electric Drill
3. Instructor
4. a. Drill press
   b. Drill bit
   c. Portable electric drill
   d. Metal
   e. Safety equipment
5. Self-Check enclosed
6. a. Drilled metal
   b. Instructor
7. Performance Test for task B-01.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	B	01	2

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INSTRUCTION SHEET

RVTC

Safety Rules

1. Keep loose clothing away from drill.
2. Always start motor before placing drill bit onto the metal that is to be drilled.
3. When drilling is complete, stop motor before reaching to remove or relocate metal.
4. When possible, secure metal with clamps or jigs.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	01	2

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INSTRUCTION SHEET

RVTC

Operating the Portable Electric Drill

1. Select proper drill bit.
2. Install bit into chuck and secure with chuck key.

   *Note: Install chuck key into each hole in chuck and tighten to assure no slipping or spinning of bit while drilling.
3. With drill press, align bit with center punch hole.
4. Raise bit about one inch, start motor, lower bit and drill hole.
5. Apply cutting oil to drill hole or drill bit to reduce heat build in drill bit.
6. For portable drill, start motor before placing drill in center punch.
7. Apply direct pressure to the drill motor to prevent breaking the drill bit.
8. Remove the drill bit, clean and return to drill index.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	01	2

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
1. Did you secure metal by clamps or jigs or both?	___	___
2. Did you allow the bit to cool before taking it out of the chuck?	___	___
3. Did you align the bit on the drill press before turning on the motor?	___	___
4. Did you follow safety procedures?	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	01	2

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PERFORMANCE TEST FOR TASK NO. E-01 RVTC

IN-9943-E-01

TASK:	Drill Metal Using Power Drilling Equipment

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given equipment and materials, you will drill metal with given instructions from your instructor. Based upon the items listed below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Was chuck tightened in all three holes with the chuck key?	....	....
2.	Was metal secured?	....	....
3.	Was a block of wood used for back-up?	....	....
4.	Was cutting oil used?	....	....
5.	Was the bit aligned properly with metal?	....	....
6.	Was overheating prevented?	....	....
7.	Were safety glasses or a face shield used?	....	....
8.	Were tools and equipment cleaned and secured?	....	....

Score _____ ☐ ATTAINED ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	B	01		Page 1 of 1

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IN-9943-B-02

WELDING

A STUDENT LEARNING GUIDE

TASK:	Cut Metal with Power Hacksaw
DUTY:	Operating Auxiliary Equipment and Tools

PURPOSE:

In metal working, steel often has to be cut to length to fit another piece. A common and easy way to obtain a good cut is to use a power hacksaw. This method of cutting has proven to be faster than most other cut-off methods as well as being more economical.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	B	02	

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: a power hacksaw and materials,

YOU WILL: measure and cut mild steel.

HOW WELL: You must successfully complete the Written Test.
Your performance will be assessed by your instructor using the Performance Test on page 11.

NOTE:
IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Prepare to cut metal with power hacksaw.
2. Measure and cut mild steel.

DEPT.	PROG.	DUTY	TASK
IN	9943	B	02

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ENABLING OBJECTIVE NO. 1

RVTC

Prepare to cut metal with power hacksaw.

LEARNING STEPS

1. Read Resource No. 1 to identify safety precautions and steps in operating a horizontal band saw.
2. When completed, check your knowledge using the Self-Check.
3. Go on to Enabling Objective No. 2.

RESOURCES

1. Dayton Band Saw Operating Instructions, excluding pages 4-11.
2. Self-Check enclosed.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	B	02	1

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SELF-CHECK

RVTC

Directions

Check your knowledge by answering the items below on a separate sheet of paper.

1. Saw blades are made of a special _____ _____.
2. Straight faced teeth with deep gullets used to rake out chips is a _____ tooth style.
3. When cutting an I-beam, the blade will most often hang up in the _____.
4. The most common type of band sawing is the horizontal _____ _____.
5. The four basic tooth styles are the hook, skip, vari and _____.
6. There are two types of band saw. The one used in this shop is the _____.
7. For maximum blade life the speed used should be _____.

Now check your answers with the Answer Key.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	02	1

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SELF-CHECK

RVTC

Answer Key

1. alloy steel
2. standard
3. web
4. cut-off
5. standard
6. horizontal
7. slow

All of your answers should agree with the answers in the Answer Key. If you missed any, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	02	1

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ENABLING OBJECTIVE NO. 2

RVTC

Measure and cut mild steel.

LEARNING STEPS

1. Read Resource No. 1 to identify precautions to practice while operating equipment.
2. Read Resource No. 2 to specify steps in measuring and cutting mild steel.
3. See instructor for your job of cutting mild steel.
4. Operate the horizontal band saw in performing your job of cutting mild steel.
5. Have instructor check your cut mild steel.
6. When you think you can attain this task, take the Written Test.
7. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. Instruction Sheet enclosed, Safety Rules
2. Instruction Sheet enclosed, Measuring and Cutting Mild Steel
3. Instructor
4. a. Horizontal band saw
   b. Materials
5. a. Cut mild steel
   b. Instructor
6. Written Test for task B-02.
7. Performance Test for task B-02.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	B	02	2

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INSTRUCTION SHEET

RVTC

Safety Rules

1. Examine the blade of the hacksaw to be sure it is secure and in good condition.
2. Always use a sharp blade that does not have teeth missing.
3. Check to see that the blade guide clears the metal so a cut about ¼" can be made.
4. Tuck in loose clothing and roll up your sleeves.
5. Always wear safety glasses.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	02	2

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INSTRUCTION SHEET

RVTC

Measuring and Cutting Mild Steel

1. A support stand should be used to support the extending metal when cutting metal longer than 3' on the horizontal band saw.
2. Be sure the saw is raised and secured at full height before putting metal in the vise clamp.
3. Using a 12' slip tape, measure the metal to the desired length for the cut. Mark on the top where the blade will touch.

   NOTE: Measure twice, cut once.
4. Place metal on cutting stand and lower saw blade. Adjust metal so that the blade will cut on the waste side of the line. Secure metal with vise jaws.

   NOTE: Waste side of the metal is opposite the end that was measured.
5. Turn machine on, wait until blade obtains full speed before gently lowering the blade onto the metal.
6. Once the cut is started, let the machine cut at its own speed. The machine will cut off automatically when the cut is finished.
7. Do not make any changes once the cut has started.
8. To make any change (position, cut, vise, tension, etc.) always turn the machine off and secure the blade arm in the vertical position.
9. After cut is made, return unused metal to metal storage and clean the machine.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	02	2

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WRITTEN TEST FOR TASK NO. B-02

RVTC

IN-9943-B-02

TASK:	Cut Metal with Power Hacksaw

Directions

The purpose of this test is to determine if you fully understand how to cut metal with a power hacksaw. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. The power hacksaw is one of the most common saws used to cut steel.
2. Angle iron is cut with the web pointing up.
3. Mild steel is the only metal that can be cut with the power hacksaw.
4. The horizontal band saw is used in this shop.
5. All metal has to be secure before cutting.
6. No safety equipment is needed to be worn when operating the power hacksaw.
7. The power hacksaw will not cut pipe.
8. Loose clothing cannot get caught in the saw.
9. The saw will turn itself off when the cut is finished.

DEPT.	PROG.	DUTY	TASK
IN	9943	B	02

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WRITTEN TEST FOR TASK NO. B-02

RVTC

IN-9943-B-02

TASK: Cut Metal with Power Hacksaw

ANSWER KEY

PAGE 1 OF 1

Multiple Choice questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

True-False questions

(T) F 1.	T (F) 6.	T F 11.	T F 16.	T F 21.
(T) F 2.	T (F) 7.	T F 12.	T F 17.	T F 22.
T (F) 3.	T (F) 8.	T F 13.	T F 18.	T F 23.
(T) F 4.	(T) F 9.	T F 14.	T F 19.	T F 24.
(T) F 5.	T F 10.	T F 15.	T F 20.	T F 25.

Matching questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

DEPT.	PROG.	DUTY	TASK
IN	9943	B	02

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PERFORMANCE TEST FOR TASK NO. B-02

RVTC

IN-9943-B-02

TASK:	Cut Metal with Power Hacksaw

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given equipment and materials, you will cut metal with given instructions from your instructor. Based upon the items listed below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Did the student make use of safety equipment?		
2.	Was the condition of the blade checked?		
3.	Was the blade secured?		
4.	Was a stand used to support the metal?		
5.	Was the metal measured and marked?		
6.	Was the metal aligned with the blade?		
7.	Was the metal secured with the table vise?		
8.	Was the saw started and blade lowered onto the metal?		
9.	Was the extra metal and equipment cleaned?		

Score _____ ☐ ATTAINED ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	B	02		Page 1 of 1

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IN-9943-B-03

WELDING

A STUDENT LEARNING GUIDE

TASK:	Shear and Punch Metal Using Iron Worker
DUTY:	Operating Auxiliary Equipment and Tools

PURPOSE:

The iron worker is a machine that can shear, punch and bend metal. This is a useful time saving machine for any shop. This Learning Guide will assist you in learning how to operate this machine different ways.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	B	03	

REVISED:				

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: an iron worker, tools and metal,

YOU WILL: operate the iron worker to shear and punch metal.

HOW WELL: You must successfully complete the Written Test. Your performance will be assessed by your instructor using the Performance Test on page 11.

NOTE:

IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Prepare to shear and punch metal with iron worker.
2. Shear metal with iron worker.
3. Punch metal with iron worker.

DEPT.	PROG.	DUTY	TASK
IN	9943	B	03

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ENABLING OBJECTIVE NO. 1

RVTC

Prepare to shear and punch metal with iron worker.

LEARNING STEPS

1. Read Resource No. 1 to identify safety precautions and steps in operating the iron worker.
2. Read Resource No. 2 to specify how to shear metal.
3. Read Resource No. 3 to specify how to punch metal.
4. When you think you can attain this task, take the Written Test.
5. Go on to Enabling Objective No. 2.

RESOURCES

1. Dvorak Iron Worker Instruction Manual, pages 1-4.
2. Instruction Sheet enclosed, Shearing Metal
3. Instruction Sheet enclosed, Punching Metal
4. Written Test for task B-03.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	B	03	1

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INSTRUCTION SHEET

RVTC

Shearing Metal

1. The iron worker will shear angle iron and flat metal.
2. To shear angle iron each piece has to be marked individually because the shear blade cuts out ¼" of waste with each cut.
3. The angle iron can be measured if more than one piece is needed by allowing ¼" of waste between each cut, (if several 6" pieces are needed, then measurements would go as follows: (6¼" - 12½" - 18 3/4" - 25", etc.)
4. If cutting pieces from a length of more than 3', a stand should be placed under the longer length for support. This makes the metal align with the cutting blade for a straight cut.
5. The tri-square is used to mark the inside of the angle iron.
6. The angle is sheared with the inside of the angle face up.
7. The shear blade must strike the interval vertex of the angle between the 6" and 6¼" mark to make the proper cut.
8. The maximum cut for this machine is 3" x 3" x ¼" angle.
9. Sheet metal is measured and marked with the tri-square.
10. Sheet metal is sheared without waste, so the cutting blade must strike the metal on the marked line.
11. "C" clamps should be used to hold the metal in place after being squared to insure a straight cut.
12. Maximum shearing capacity is not to exceed ¼" for mild steel.

CAUTION: Keep hands and loose clothing away from machine before starting the shearing action.

CAUTION: Never use your hands to hold or retrieve metal unless the machine is turned off.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	03	1

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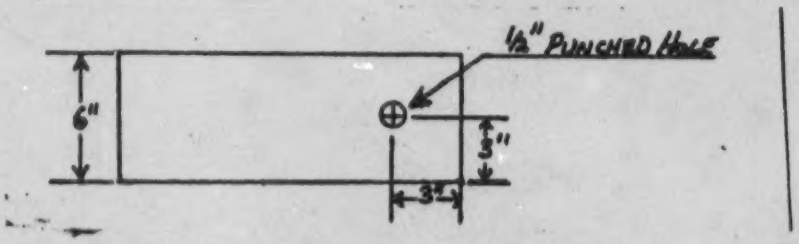
INSTRUCTION SHEET

RVTC

Punching Metal

1. Determine the hole size needed; then install proper punch and die.
2. Support stands must be used if the metal being punched exceeds 3' in length.
3. Thickness of plate to be punched for this machine is not to exceed 3/8".
4. To punch sheet metal, the metal must be measured and marked from one side and one end to get the location of the hole.
5. The metal is then placed over the die so the punch will strike the center of the crosslines. See illustration below.

   CAUTION: Always lubricate punch and die with cutting oil.



6. To punch angle iron, follow the preceding procedure.

   CAUTION: If angle iron is set in too close to the stripper and punch, the barrel guide will strike the vertical part of the angle causing damage to the machine and angle iron.

7. Upon completion of this, clean oil form the machine and return tools to crib.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	03	2

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WRITTEN TEST FOR TASK NO. B-03

RVTC

IN-9943-B-03

TASK: Shear and Punch Metal Using Iron Worker

Directions

The purpose of this test is to determine if you fully understand how to shear and punch metal using the iron worker. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. This machine can shear 3/4" thick metal.
2. Lubrication is needed only once.
3. The metal thickness can not exceed the diameter of the punch.
4. Cutting angle iron has 1/4" of waste per cut.
5. There is 1/8" of waste metal when shearing sheet metal.
6. Angle iron can only be measured and sheared one piece at a time.
7. All cuts have to be measured and squared before cutting.
8. "C" clamps can be used to hold metal in place.

DEPT.	PROG.	DUTY	TASK
IN	9943	B	03

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WRITTEN TEST FOR TASK NO. B-03

RVTC

IN-9943-B-03

TASK: Shear and Punch Metal Using Iron Worker

ANSWER KEY

PAGE 1 OF 1

Multiple Choice questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

True-False questions

T (F) 1.	T (F) 6.	T F 11.	T F 16.	T F 21.
T (F) 2.	(T) F 7.	T F 12.	T F 17.	T F 22.
(T) F 3.	(T) F 8.	T F 13.	T F 18.	T F 23.
(T) F 4.	T F 9.	T F 14.	T F 19.	T F 24.
T (F) 5.	T F 10.	T F 15.	T F 20.	T F 25.

Matching questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

DEPT.	PROG.	DUTY	TASK
IN	9943	P	03

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ENABLING OBJECTIVE NO. 2

RVTC

Shear metal with iron worker.

LEARNING STEPS

1. Review Resource No. 1 to be sure you understand how to shear metal.
2. See instructor for your job of shearing metal.
3. Shear metal with iron worker.
4. When completed, evaluate your work using the Self-Check.
5. Have instructor check your finished metal.
6. Go on to Enabling Objective No. 3.

RESOURCES

1. Instruction Sheet enclosed, Shearing Metal
2. Instructor
3. a. Metal
   b. Iron worker
4. Self-Check enclosed.
5. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	B	03	2

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

		YES	NO
1.	Did you check the condition of the machine?.....	___	___
2.	Did you lubricate the cutting blades with cutting oil?..	___	___
3.	Was angle iron marked allowing for waste cut?.....	___	___
4.	Was sheet metal squared on work table?.....	___	___
5.	Were support stands used for angle and sheet metal?.....	___	___
6.	Did you use clamps to secure sheet metal before each cut?.....	___	___
7.	Did you clean the machine of waste and oil upon completion?.....	___	___

If you received a "NO" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	03	2

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ENABLING OBJECTIVE NO. 3

RVTC

Punch metal with iron worker.

LEARNING STEPS

1. Review Resource No. 1 to be sure you understand how to punch metal.
2. See instructor for your job of punching metal.
3. Punch metal with iron worker.
4. Have instructor check your finished metal.
5. When you think you can perform this task, take the Performance Test.

RESOURCES

1. Instruction Sheet enclosed, Punching Metal
2. Instructor
3. a. Metal
   b. Iron worker
   c. Instructor
4. Instructor
5. Performance Test for task B-03.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	03	3

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PERFORMANCE TEST FOR TASK NO. B-03

RVTC

IN-9943-B-03

TASK: Shear and Punch Metal Using Iron Worker

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given equipment, materials and tools, you will shear and punch metal. Based upon the items listed below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Did the student use the tri-square?	....	....
2.	Was the metal aligned?	....	....
3.	Were clamps used to secure the metal?	....	....
4.	Were support stands used?	....	....
5.	Were the blades and punch lubricated?	....	....
6.	Was the condition of the machine checked?	....	....
7.	Was the metal kept from piling up under the shear blade?	....	....
8.	Was the machine clean and tools returned to the crib?	....	....

Score _____ ☐ ATTAINED ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	B	03		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-B-04

WELDING

A STUDENT LEARNING GUIDE

TASK:	Wire Brush with Power Equipment
DUTY:	Operating Auxiliary Equipment and Tools

PURPOSE:

Brushing is used to remove slag, paint, mill, scale, rust, etc. Using power equipment to wire brush makes this job quicker and easier.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	B	04	

REVISED :				

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: a work station, power unit, metal, 7" round brush and tools,

YOU WILL: wire brush.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 11.

NOTE:

IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Prepare equipment to wire brush.
2. Wire brush with power equipment.

DEPT.	PROG.	DUTY	TASK
IN	9943	B	04

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ENABLING OBJECTIVE NO. 1

RVTC

Prepare equipment to wire brush.

LEARNING STEPS

1. Read Resource No. 1 to identify steps in preparing equipment to wire brush.
2. Check your knowledge using the Self-Check.
3. Go on to Enabling Objective No. 2.

RESOURCES

1. Instruction Sheet enclosed, Preparing Equipment for Wire Brushing
2. Self-Check enclosed.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	B	04	1

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INSTRUCTION SHEET

RVTC

7. The electric cord should always be free of kinks and well away from the rotating part of the power unit.

8. All loose clothing should be rolled up, buttoned, tucked in, etc.

   NOTE: Loose clothing can get caught in moving parts and therefore cause injury to equipment and operator.

9. Wire brushing can be done with either air drive or electric drive. All precautions are to be used with both units!

10. Brushing is to be done on front edge and top surface. After brushing this area, loosen the "C" clamp and rotate the metal. Brush the area that was under the clamp.

11. Wear a glove on the hand closest to the wire brush.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	04	1

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SELF-CHECK

RVTC

Directions

Check your knowledge by answering the items below on a separate sheet of paper.

1. The two different methods of driving a power unit are _____ and _____.
2. The two types of securing devices used are _____ _____ and _____ _____.
3. The metal is secured on one _____.
4. To insure no damage to the power unit when the unit is not in use, it is placed on the _____ or _____.
5. The brush always rotates to the _____.
6. Loose clothing could get caught in the brush and cause _____.

Now check your answers with the Answer Key.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	04	1

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SELF-CHECK

RVTC

Answer Key

1. air, electric
2. "C" clamp, vise pliers
3. corner
4. table, floor
5. right
6. injury

All of your answers should agree with the answers on the Answer Key. If you missed any, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	04	1

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ENABLING OBJECTIVE NO. 2

RVTC

Wire brush using power equipment.

LEARNING STEPS

1. Read Resource No. 1 to specify steps in operating power brush equipment.
2. See instructor for your job of operating power brush equipment.
3. Operate the power brush equipment by following the steps in Resource No. 1.
4. When completed, evaluate your work using the Self-Check.
5. Have instructor check your wire brushing.
6. When you think you can perform this task, take the Performance Test.

RESOURCES

1. Instructor Sheet enclosed, Operating Power Brush Equipment
2. Instructor
3. a. Power unit
   b. Round brush
   c. Metal
   d. Tools
4. Self-Check enclosed.
5. a. Finished product
   b. Instructor
6. Performance Test for Task B-04.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	B	04	1

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INSTRUCTION SHEET

RVTC

Operating Power Brush Equipment

1. Put on safety glasses and a glove on your left hand (if left handed, put the glove on your right hand).

   NOTE: Bristles from the brush will break off and fly away from the brush at high speed. This is the reason safety glasses or a face shield should be worn.

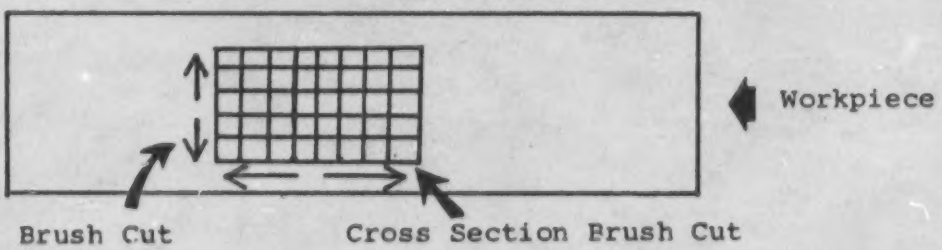
2. Turn switch on the unit to the "off" position and place the unit well upon the table or on the floor, then plug it in.

3. Hold the power unit securely in your hands and turn on.

4. Always start the unit and let it build to top speed before placing on the metal to be brushed.

5. Hold the unit at a 45° angle to the workpiece when brushing.

6. Let the brush go in one direction, then rotate the unit so it will brush in a cross section



7. This cross section brush cut wears away the surface quicker.

8. Always let brush rotate off the edges.

   NOTE: Brush should turn from inner part of metal to the edges. This prevents the brush from catching on the edge and jumping back.

9. When surface is completed, turn the unit off and let the brush come to a stop on the metal. Place unit on the floor.

10. Unplug and wrap up the cord and return power equipment and tools to the crib.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	04	2

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SELF-CHECK

RVTC

Directions

Evaluate your work using the items below.

All items should receive a "yes" response.

	YES	NO
1. Was the unit in the "off" position before it was plugged in?.....	____	____
2. Was safety equipment used?.....	____	____
3. Was the power unit started before placing the brush on the metal?.....	____	____
4. Was loose clothing tucked in?.....	____	____
5. Was cord free of tangles?.....	____	____
6. Was the power unit and brush checked for tightness?....	____	____

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	B	04	2

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PERFORMANCE TEST FOR TASK NO. B-04

RVTC

TASK:	Wire Brush with Power Equipment

IN-9943-B-04

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given power unit, brush, tools and metal, you will wire brush metal using the power equipment. Based upon the items listed below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Did student use safety equipment?		
2.	Was metal secured?		
	While operating the power unit, did student:		
3.	a. hold the unit at a 45° angle?		
4.	b. use the crosscut method?		
5.	c. let the brush rotate off the edges?		
6.	d. stop the brush on the metal?		
7.	Was equipment secured?		

Score _____ ☐ ATTAINED ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	B	04		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-E-10

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Outside Corner Joints: Horizontal Position
DUTY:	Operating Shielded Metal Arc Welding Equipment

PURPOSE:

The outside corner joint is widely used in the fabrication of tanks, containers and various structural forms. It is important that you attain competency in this task to be able to make this type of weld in the horizontal position.

09

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	E	10	E-06

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, materials and a work station,

YOU WILL: setup the work station, tackweld and weld a series of cutside corner welds in the horizontal position.

HOW WELL: You must successfully complete the Written Test.
Your performance will be assessed by your instructor using the Performance Test on page 10.

ENABLING OBJECTIVES:

1. Setup the work station, tackweld and weld outside corner joints in the horizontal position.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	10

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ENABLING OBJECTIVE NO. 1

RVTC

Setup the work station, tackweld and weld outside corner joints in the horizontal position.

LEARNING STEPS

1. Setup work station and tack-weld plates to form three (3) outside corner joints.
2. Read Resource No. 2 to determine positioning and welding sequence for outside corner joints.
3. Weld outside corner joints by following instructions in Resource No. 2.

   Have instructor check your work.
4. When completed, evaluate your work using the Self-Check.
5. When you think you can attain this task, take the Written Test.
6. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. a. Work station
   b. Equipment
   c. Materials -- 4 pieces 3/8" or 1/2" x 2" x 8" mild steel plate
2. Instruction Sheet enclosed, Positioning and Welding Outside Corner Joints
3. a. Work station
   b. Equipment
   c. Materials
   d. Instructor
4. Self-Check enclosed.
5. Written Test for task E-10.
6. Performance Test for task E-10.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	10	1

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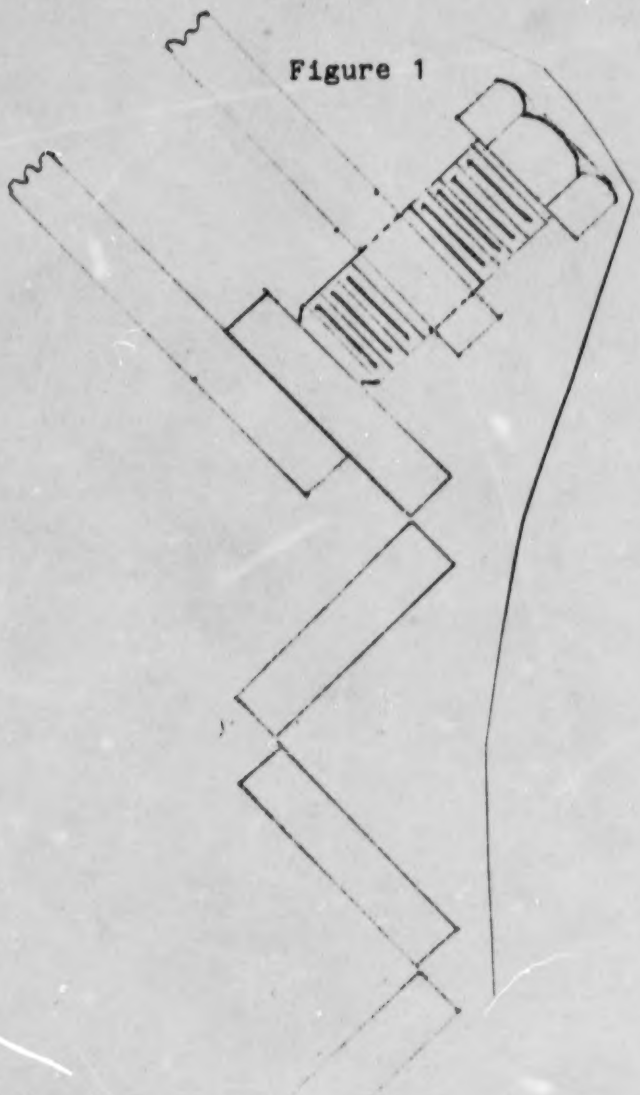
INSTRUCTION SHEET

RVTC

Positioning and Welding Outside Corner Joints

1. Position the workpiece in the welding fixture as shown in Figure 1.

Figure 1



DEPT.	PROG.	DUTY	TASK	EN OBJ.
IN	9943	E	10	1

con't.

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INSTRUCTION SHEET

RVTC

2. Deposit the root pass. You should have 100% penetration.

3. Deposit the second pass near the lower edge of the weld joint. Be sure to overlap more than half of the root pass. See Figure 2.

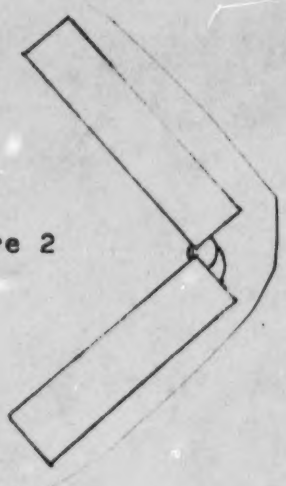

Figure 2

4. Deposit the third pass by overlapping the second pass and fusing with upper section of weld joint. See Figure 3.

Figure 3

5. Additional layers of weld beads may be necessary to make sure the weld joint is full and slightly rounded. Deposit these beads from bottom to top of weld joint.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	10	1

con't.

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INSTRUCTION SHEET

RVTC

6. Weld other two outside corner joints using the same procedure.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	10	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
1. Do the finished welds have 100% penetration?.....	___	___
2. Are the throat sizes at least as thick as the base metal?.....	___	___
3. Are the welds free of porosity and slag inclusions?....	___	___
4. Is the surface ripple uniform on all beads?.....	___	___
5. Are weld joints full from end to end?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	10	1

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WRITTEN TEST FOR TASK NO. E-10

RVTC

TASK:	Weld Outside Corner Joints in the Horizontal Position

IN-9943-E-10

Directions

The purpose of this test is to determine if you fully understand how to weld outside corner joints in the horizontal position. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. The amperage range for any electrode is to allow for different thicknesses of the metal to be welded.
2. When welding 1/2" thick metal the throat size must be at least 3/8".
3. In order to obtain the correct throat size on an outside corner weld, the weld must be full and rounded.
4. To obtain 100% penetration you must have a space at the root of the joint or carry a keyhole or both.
5. Too long an arc length will cause excess splatter and undercutting
6. To avoid sag at the bottom edge of the weld, your travel speed must be faster.
7. It is not necessary to adjust the amperage once you have started welding an outside corner.
8. The outside corner joint is not widely used.
9. If you are in a hurry it is not necessary to remove the slag before making another pass.
10. Each weld bead must melt and fuse into the adjoining metal.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	10

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WRITTEN TEST FOR TASK NO. E-10

RVTC

TASK: Weld Outside Corner Joints in the Horizontal Position

ANSWER KEY

PAGE 1 OF 1

Multiple Choice questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

True-False questions

(T) F 1.	(T) F 6.	T F 11.	T F 16.	T F 21.
T (F) 2.	T (F) 7.	T F 12.	T F 17.	T F 22.
(T) F 3.	T (F) 8.	T F 13.	T F 18.	T F 23.
(T) F 4.	T (F) 9.	T F 14.	T F 19.	T F 24.
(T) F 5.	(T) F 10.	T F 15.	T F 20.	T F 25.

Matching questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	10

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PERFORMANCE TEST FOR TASK NO. E-10 RVTC

IN-9943-E-10

TASK:	Weld Outside Corner Joints in the Horizontal Position

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given a work station and material, you will make all setups and weld a series of outside corner joints in the horizontal position. Based upon the items below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Did all of the welds have 100% penetration?		
2.	Were the welds full and rounded?		
3.	Were the beads deposited in the proper sequence?		
4.	Was the surface ripple of the weld beads uniform?		
5.	Were the welds free of porosity and slag inclusions?		
6.	Did the beads overlap without rolling over?		
7.	Was the bead at the bottom edge of the joint deposited without sagging?		
8.	Was there a minimum of undercut?		
9.	Were the throat sizes at least as thick as the base metal?		
10.	Were all joints welded?		

Score _____ ☐ ATTAINED ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	E	10		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-E-11

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Butt Joints: Horizontal Position
DUTY:	Operating Shielded Metal Arc Welding Equipment

PURPOSE:

The butt weld is a common weld joint used in most welded fabrications. You must be able to perform this weld in the horizontal position where it is necessary for the job to be completed.

10

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	E	11	E-10

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, metal and a work station,

YOU WILL: setup, tackweld and weld a series of butt welds in the horizontal position.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 5.

ENABLING OBJECTIVES:

1. Setup, tackweld and weld a series of butt welds.

DEPT.	PROG.	DUTY	TASK
IN	9273	E	11

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ENABLING OBJECTIVE NO. 1

RVTC

Setup, tackweld and weld a series of butt welds.

LEARNING STEPS

1. Read Resource No. 1 to identify the steps in tackwelding butt joints.
2. Tackweld butt joints by following the steps in Resource No. 1
3. Read Resource No. 3a and view Resource No. 3b showing how to position and weld butt joints.
4. Position and weld the butt joints by following the steps in Resource No. 3.
5. When completed, evaluate your work using the Self-Check.

   Have your instructor check your work.
6. When you think you can perform this task, take the Performance Test.

RESOURCES

1. PAT Workbook Topic 11, Job Practice, page 27.
2. a. Work station
   b. Tools
   c. Materials -- 5 pieces 3/16" x 2" x 8" steel plate
3. a. PAT Workbook Topic 11, Job Practice, pages 28-29.
   b. Beseler Cue See; Topic 11.
4. a. Work station
   b. Tools
   c. Materials
5. a. Self-Check enclosed.
   b. Instructor
6. Performance Test for task E-11.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9273	E	11	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items must receive a "yes" response.

	YES	NO
1. Do you have 100% penetration on all welds?.....	___	___
2. Does the cover pass completely cover all of the undercut left by the first pass?.....	___	___
3. Is the weld joint full from end to end?.....	___	___
4. Is the surface ripple of the weld beads uniform?.....	___	___
5. Have you removed all of the slag?.....	___	___

If you received a "no" response for any item go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	11	1

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PERFORMANCE TEST FOR TASK NO. E-11

RVTC

IN-9943-E-11

TASK: Weld Butt Joints in the Horizontal Position

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given a work station and material, you will setup, tackweld and weld a series of butt joints in the horizontal position. Based upon the items below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Were the plates tackwelded according to instructions?		
2.	Did all welds have 100% penetration?		
3.	Did the cover passes completely cover all undercut?		
4.	Were the cover passes convex and slightly higher than the plate surfaces?		
5.	Were the welds free of porosity?		
6.	Was all slag removed?		
7.	Were the weld joints full from end to end?		
8.	Was the surface ripple of the beads uniform?		
9.	Did the student hold the proper arc length and electrode angle?		
10.	Was the work station secured?		

☐ ATTAINED
☐ NOT ATTAINED

Score _____ EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	E	11		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-E-12

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Single and Multiple Pass Lap Joints: Vertical Position
DUTY:	Operating Shielded Metal Arc Welding Equipment

PURPOSE:

Welding in the vertical position is a difficult operation. Many jobs shich cannot be moved require making vertical welds. Therefore, the welder needs to become competent in making vertical welds.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	E	12	E-11

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, metal and a work station,

YOU WILL: tackweld, position and weld single and multiple pass lap joints in the vertical position.

HOW WELL: You must successfully complete the Written Test. Your performance will be assessed by your instructor using the Performance Test on page 8.

ENABLING OBJECTIVES:

1. Weld single pass lap joints in the vertical position.
2. Weld multiple pass lap joints in the vertical position.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	12

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ENABLING OBJECTIVE NO. 1

RVTC

Weld single pass lap joints in the vertical position.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to position and weld single pass lap joints in the vertical position.
2. Tackweld and position steel plates by following the steps in Resource No. 1.
3. Weld single pass joints in the vertical position.

   Have instructor check your work.
4. When completed, evaluate your work using the Self-Check.
5. Go on to Enabling Objective No. 2.

RESOURCES

1. a. PAT Workbook-- Topic 13; SMAW-B, Job Practice - Items 1,2 and 3, pages 32-33.
   b. Beseler Cue See; Topic 13
2. a. Work station
   b. Equipment
   c. Material -- 5 pieces 3/16" x 3" x 8" steel plate
3. a. PAT Workbook -- Topic 13; SMAW-B, Job Practice - Item 3, page 33.
   b. Beseler Cue See; Topic 13.
   c. Instructor
4. a. Self-Check enclosed

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	12	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.
All items should receive a "yes" response.

		YES	NO
1.	Are the welds free of undercut?.....	___	___
2.	Are the weld joints filled completely and slightly convex?.....	___	___
3.	Is the surface ripple of the weld beads uniform?.....	___	___
4.	Has all slag and weld splatter been removed?.....	___	___
5.	Does the weld cover the joints from edge to edge?.....	___	___
6.	Are the welds free of porosity and slag entrapment?.....	___	___
7.	Are all joints welded?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	12	1

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ENABLING OBJECTIVE NO. 2

RVTC

Weld multiple pass lap joints in the vertical position.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to position and weld multiple pass lap joints in the vertical position.
2. Tackweld and position steel plates by following the steps in Resource No. 1.
3. Weld multiple pass lap joints in the vertical position.

   Have instructor check your work.
4. When you think you can attain this task, take the Written Test.
5. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. a. PAT Workbook -- Topic 15; SMAW-B, Job Practice - Items 1,2 and 3, pages 37, 38 and 39.
   b. Beseler Cue See; Topic 15
2. a. Work station
   b. Equipment
   c. Material -- 5 pieces ½" x 3" x 8" steel plate
3. a. Pat Workbook -- Topic 15; SMAW-B, Job Practice - Item 3, pages 37, 38 and 39
   b. Beseler Cue See; Topic 15
   c. Instructor
4. Written Test for task E-12.
5. Performance Test for task E-12.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	12	2

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WRITTEN TEST FOR TASK NO. E-12

RVTC

TASK: Weld Single and Multiple Pass Lap Joints: Vertical Position

Directions

The purpose of this test is to determine if you fully understand how to weld single and multiple pass lap joints in the vertical position. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. The electrode should be angled (pointed) upward approximately 45° when making a vertical lap weld.
2. If you increase the electrode angle as you travel upward, the weld will become narrow and high crowned?
3. An inverted "T" motion will help you deposit a wider and flatter bead.
4. The surface ripples of the weld beads should be 1/8" to 3/16" apart.
5. When making the 2nd and 3rd weave beads, you should pause at the toe lines of the previous beads to prevent undercut.
6. You need to hold a longer arc length when making a vertical lap weld.
7. If the weld puddle gets too hot or too large, the weld will sag down in the center.
8. Slag entrapment in the center of the weld beads is caused by not coming back into the puddle close enough.
9. The whip and pause motion should not be used when welding vertically.
10. Vertical position welding is not used very often.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	12

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WRITTEN TEST FOR TASK NO. E-12

RVTC

TASK:	Weld Single and Multiple Pass Lap Joints: Vertical Position

ANSWER KEY

PAGE 1 OF 1

Multiple Choice questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

True-False questions

T (F) 1.	T (F) 6.	T F 11.	T F 16.	T F 21.
(T) F 2.	(T) F 7.	T F 12.	T F 17.	T F 22.
(T) F 3.	(T) F 8.	T F 13.	T F 18.	T F 23.
T (F) 4.	T (F) 9.	T F 14.	T F 19.	T F 24.
(T) F 5.	T (F) 10.	T F 15.	T F 20.	T F 25.

Matching questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	12

PERFORMANCE TEST FOR TASK NO. E-12 RVTC

TASK:	Weld Single and Multiple Pass Lap Joints: Vertical Position

IN-9943-E-12

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given standard arc welding equipment, metal plates and electrodes, you will make the necessary setups and weld single and multiple pass lap joints in the vertical position. Based upon the items below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Were the plates overlapped approximately ½ the width when tack welded?		
2.	Were the plates tack welded securely on both ends?		
3.	Were the weld joints full from edge to edge?		
4.	Were the throat sizes equal to the thickness of the base metal?		
5.	Were the weld joints full without sagging back?		
6.	Was the surface ripple of all beads uniform and approximately 1/16" to 3/32" apart?		
7.	Were the welds free of undercut?		
8.	Was all slag and weld splatter removed?		
9.	Were the leg lengths approximately equal?		
10.	Were all joints welded?		

☐ ATTAINED
Score _____ ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	E	12		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld 3 Pass and 6 Pass "Tee" Joints: Vertical Position
DUTY:	Operating Shielded Metal Arc Welding Equipment

PURPOSE:

The "Tee" joint is one of the most common joints encountered in welding. Therefore, it is necessary that the welder attain the skills needed to perform this weld in the vertical position.

12

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	E	13	E-12

REVISED				

IN-9943-E-13

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, metal and a work station,

YOU WILL: tackweld, position and weld three (3) pass and six (6) pass "tee" joints in the vertical position.

HOW WELL: You must successfully complete the Written Test.
Your performance will be assessed by your instructor using the Performance Test on page 10.

ENABLING OBJECTIVES:

1. Weld 3 pass "tee" joints: vertical position.
2. Weld 6 pass "tee" joints: vertical position.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	13

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ENABLING OBJECTIVE NO. 1

RVTC

Weld 3 pass "tee" joints: vertical position.

LEARNING STEPS

1. Read Resource No. 1a and 1b and view Resource No. 1c to determine how to position and weld 3 pass "tee" joints: vertical position.
2. Tackweld and position plates by following the steps in Resource No. 1.
3. Weld 3 pass "tee" joints: vertical position.

   Have instructor check your work.
4. When completed, evaluate your work using the Self-Check.
5. Go on to Enabling Objective No. 2.

RESOURCES

1. a. PAT Workbook - Topic 15; SMAW-B, Job Practice - Items 1, 2, and 3, pages 37, 38 and 39.
   b. Instruction Sheet enclosed, Positioning and Tacking Plates
   c. Beseler Cue See; Topic 15
2. a. Work station
   b. Tools
   c. Materials:
      (a) 1 piece ¼" x 4" x 8" mild steel plate
      (b) 2 pieces ¼" x 2" x 8" mild steel plate
3. a. Work station
   b. Tools
   c. Instructor
4. Self-Check enclosed.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	13	1

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INSTRUCTION SHEET

RVTC

Positioning and Tacking Plates

DEPT	PROG	DUTY	TASK	ENABL
IN	9943	E	13	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.
All items should receive a "yes" response.

		YES	NO
1.	Is the surface ripple of the welds uniform?.....	___	___
2.	Are the welds free of undercut?.....	___	___
3.	Are the leg lengths approximately equal?.....	___	___
4.	Are the throat sizes $\frac{1}{4}$" or more?.....	___	___
5.	Are the welds free of porosity and slag inclusions?.....	___	___
6.	Has all weld splatter been removed?.....	___	___
7.	Were all joints welded?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	13	1

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ENABLING OBJECTIVE NO. 2

RVTC

Weld 6 pass "tee" joints: vertical position.

LEARNING STEPS

1. Read Resource No. 1a and 1b and view Resource No. 1c to determine how to position and weld 6 pass "tee" joints: vertical position.

2. Tackweld and position plates by following the steps in Resource No. 1.

3. Weld 6 pass "tee" joints: vertical position.

   Have instructor check your work.

4. When you think you can attain this task, take the Written Test.

5. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. a. PAT Workbook - Topic 14; SMAW-B, Job Practice - Items 1, 2 and 3, pages 34, 35 and 36.
   b. Instruction Sheet enclosed, Weld Bead Sequence
   c. Beseler Cue See; Topic 14

2. a. Work station
   b. Tools
   c. Materials:
      (a) 1 piece $\frac{1}{4}$" x 4" x 8" mild steel plate
      (b) 2 pieces $\frac{1}{4}$" x 2" x 8" mild steel plate

3. a. Work station
   b. Tools
   c. Instructor

4. Written Test for task E-13.

5. Performance Test for task E-13.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	13	2

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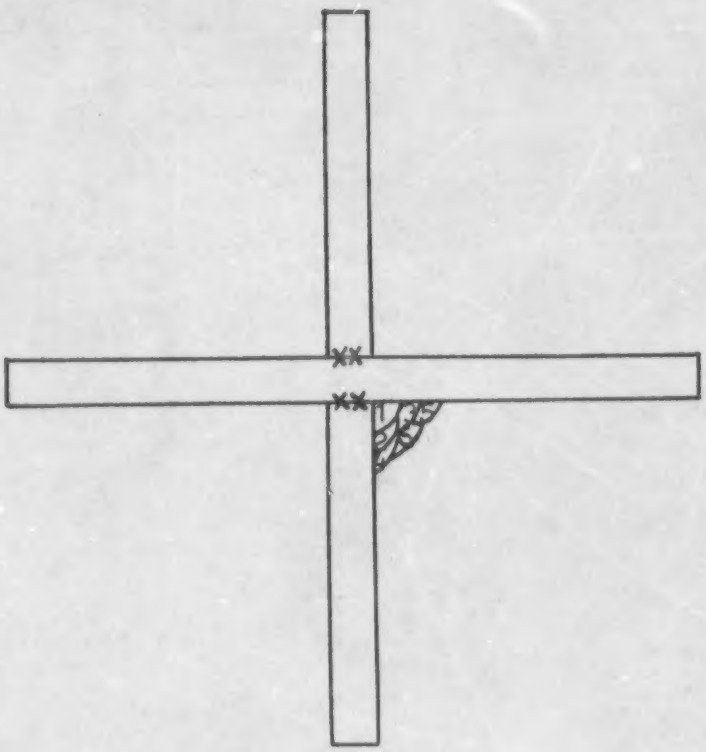
INSTRUCTION SHEET

RVTC

Weld Bead Sequence



DEPT	PROG	DUTY	TASK	SEQ
IN	9943	E	13	2

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WRITTEN TEST FOR TASK NO. E-13

RVTC

TASK:	Weld 3 Pass and 6 Pass "Tee" Joints: Vertical Position

IN-9943-E-13

Directions

The purpose of this test is to determine if you fully understand how to weld 3 pass and 6 pass "tee" joints in the vertical position. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. The root pass on a vertical weld is made using the whip and pause or inverted "T" motion.
2. Increasing the electrode angle as you travel upward will help you control the puddle.
3. The second pass of a three pass "tee" joint should be approximately three electrode diameters wide.
4. Whipping upward one to two electrode diameters allows the puddle to cool.
5. Pausing at the toe line when making a weave bead will cause undercut.
6. Holding a close arc length will give you better puddle control and less splatter.
7. When making a six pass "tee" weld vertically, the last bead should be deposited in the center of the weld joint.
8. Vertical up welding is faster than vertical down welding.
9. Vertical up welding is stronger than vertical down welding.
10. The surface ripples of the weld beads should be 1/16" to 3/32" apart.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	13

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WRITTEN TEST FOR TASK NO. E-13

RVTC

TASK:	Weld 3 Pass and 6 Pass "Tee" Joints: Vertical Position

ANSWER KEY

PAGE 1 OF 1

Multiple Choice questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

True-False questions

(T) F 1.	(T) F 6.	T F 11.	T F 16.	T F 21.
T (F) 2.	(T) F 7.	T F 12.	T F 17.	T F 22.
(T) F 3.	T (F) 8.	T F 13.	T F 18.	T F 23.
(T) F 4.	(T) F 9.	T F 14.	T F 19.	T F 24.
T (F) 5.	(T) F 10.	T F 15.	T F 20.	T F 25.

Matching questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	13

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PERFORMANCE TEST FOR TASK NO. E-13 RVTC

IN-9943-E-13

TASK:	Weld 3 Pass and 6 Pass "Tee" Joints: Vertical Position

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given standard arc welding equipment, metal plates and electrodes, you will make the necessary setups and weld two 3 pass and two 6 pass "tee" joints: vertical position on the same workpiece.

Based upon the items below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Were the plates tack welded to form a cross?		
2.	Were the plates tack welded securely on both ends?		
3.	Were the leg lengths approximately equal on each weld joint?		
4.	Were the throat sizes 1/4" or more?		
5.	Were the weld faces slightly convex without sagging?.....		
6.	Was the surface ripple of all beads uniform?		
7.	Were the welds free of undercut and slag inclusion?		
8.	Was the last weld bead on the six pass welds deposited in the center of the joint?		
9.	Was all slag and weld splatter removed?		
10.	Were all joints welded?		

☐ ATTAINED

Score _____ ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	E	13		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-E-14

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Outside Corner Joints: Vertical Position
DUTY:	Operating Shielded Metal Arc Welding Equipment

PURPOSE:

The outside corner joint is frequently used in the manufacture of tanks, storage bins and other types of containers because of the metal requiring no preparation for welding. It is important that the welder attain the skills needed to perform this weld in the vertical position.

13

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	E	14	E-13

REVISED				

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, metal and a work station,

YOU WILL: tackweld, position and weld outside corner joints in the vertical position.

HOW WELL: You must successfully complete the Written Test. Your performance will be assessed by your instructor using the Performance Test on page 8.

ENABLING OBJECTIVES:

1. Weld outside corner joints in the vertical position.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	14

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ENABLING OBJECTIVE NO. 1

RVTC

Weld outside corner joints in the vertical position.

LEARNING STEPS

1. Read Resource No. 1 to determine how to tackweld plates for outside corner joints.
2. Tackweld plates by following the steps in Resource No. 1.
3. Weld outside corner joints.

   Have instructor check your work.
4. When completed, evaluate your work using the Self-Check.
5. When you think you can attain this task, take the Written Test.
6. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. Instruction Sheet enclosed, Tackwelding Outside Corner Joints.
2. a. Work station
   b. Tools
   c. Material: 4 pieces ½" x 2" x 8" mild steel plate
3. a. Work station
   b. Tools
   c. Beseler Cue See; Topic 15
   d. Instructor
4. Self-Check enclosed.
5. Written Test for task E-14.
6. Performance Test for task E-14.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	14	1

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INSTRUCTION SHEET

RVTC

Tackwelding Outside Corner Joints

1. Position plates to leave approximately 1/16" space as shown in Figure 1.
2. Tackweld on inside of angle approximately 1/2" from each end.
3. Tackweld remaining plates to form three outside corner joints as shown by Figure 2.

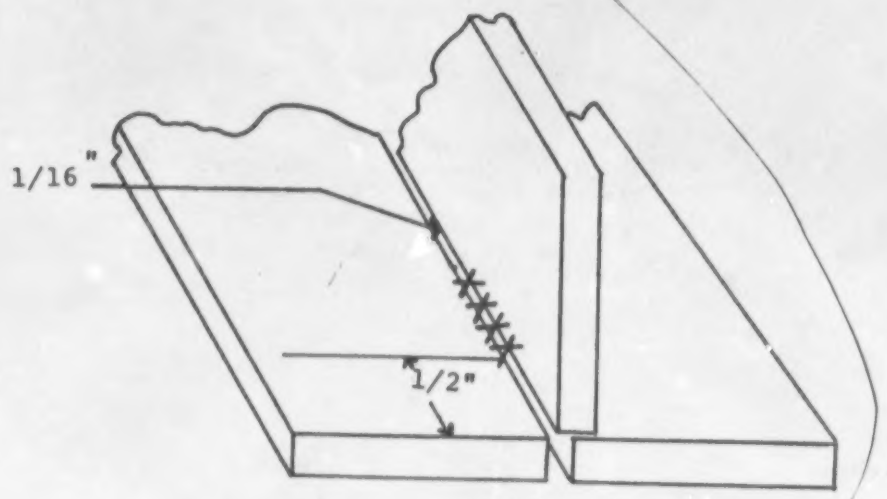

Figure 1

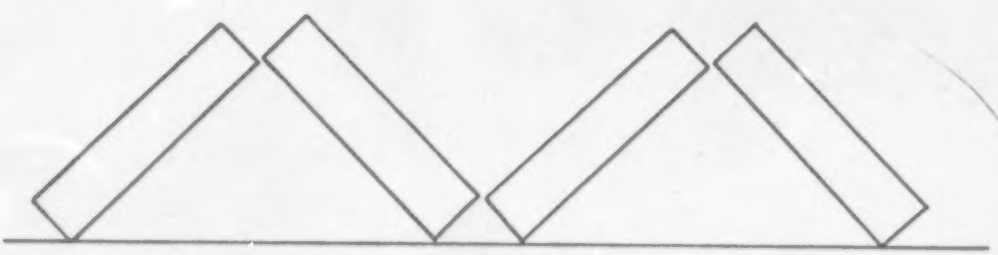

Figure 2

DEPT	PROG	DUTY	TASK	EN. OBJ.
IN	9943	E	14	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
1. Do the finished welds have 100% penetration?.....	___	___
2. Are the throat sizes at least as thick as the base metal?.....	___	___
3. Are the welds free of porosity and slag inclusions?....	___	___
4. Is the surface ripple uniform on all welds?.....	___	___
5. Are the weld joints full and slightly rounded?.....	___	___

If you recieved a "no" response for any item go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	14	1

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WRITTEN TEST FOR TASK NO. E-14

RVTC

TASK: Weld Outside Corner Joints: Vertical Position

Directions

The purpose of this test is to determine if you fully understand how to weld outside corner joints in the vertical position. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. To obtain 100% penetration, you must carry a keyhole when making the root pass.
2. The weld face should be slightly rounded and at least as thick as the base metal on an outside corner weld.
3. You need to hold a longer arc length when making a vertical weld.
4. The electrode should be angled (pointed) upwards approximately 5° to 10° when welding an outside corner vertically.
5. The first weave bead should be approximately three electrode diameters wide.
6. It may be necessary to deposit more than three weld beads in order to fill the joint completely.
7. A vertical up weld is not as strong as one made vertical down.
8. Tack welding the plates on the inside of the angle will help prevent the space from closing as you make the root pass.
9. The surface ripples of the weld beads should be approximately 3/16" apart.
10. If the weld bead sags down in the center it is an indication that the puddle is too hot or too large.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	14

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WRITTEN TEST FOR TASK NO. E-14

RVTC

TASK:	Weld Outside Corner Joints: Vertical Position

ANSWER KEY

PAGE 1 OF 1

Multiple Choice questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

True-False questions

(T) F 1.	(T) F 6.	T F 11.	T F 16.	T F 21.
(T) F 2.	T (F) 7.	T F 12.	T F 17.	T F 22.
T (F) 3.	(T) F 8.	T F 13.	T F 18.	T F 23.
(T) F 4.	T (F) 9.	T F 14.	T F 19.	T F 24.
(T) F 5	(T) F 10.	T F 15.	T F 20.	T F 25.

Matching questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	14

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PERFORMANCE TEST FOR TASK NO. E-14 RVTC

TASK:	Weld Outside Corner Joints: Vertical Position

IN-9943-E-14

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given standard metal arc welding equipment, metal plates and electrodes, you will make the necessary setups and weld outside corner joints in the vertical position. Based upon the items below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Were the four plates tack welded to form three outside corner joints?		
2.	Did all of the welds have 100% penetration?		
3.	Were the weld joints full and weld faces slightly rounded?		
4.	Was the surface ripple of all beads uniform?		
5.	Were the welds free of porosity and slag inclusions?		
6.	Were the weld joints full from end to end?		
7.	Was there a minimum of undercut along the edges of the welds?		
8.	Was all slag and weld splatter removed?		
9.	Were all the craters filled?		
10.	Were all joints welded completely?		

☐ ATTAINED

Score _____ ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	E	14		Page 1 of 1

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IN-9943-E-15

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Butt Joints: Vertical Position
DUTY:	Operating Shielded Metal Arc Welding Equipment

PURPOSE:

Many fabrication and structural jobs require butt welds in ¼" thick metal. It is most important that the welder attain the skills needed to perform this weld in the vertical position because you cannot always position the plates for flat position welding.

14

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	E	15	E-14

REVISED				

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, metal and a work station,

YOU WILL: setup, tackweld and weld a series of butt welds in the vertical position.

You must successfully complete the Written Test.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 7.

ENABLING OBJECTIVES:

1. Setup, tackweld and weld a series of butt welds.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	15

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ENABLING OBJECTIVE NO. 1

RVTC

Setup, tackweld and weld a series of butt welds.

LEARNING STEPS

1. Read Resource No. 1 to identify the steps in tackwelding butt joints.
2. Tackweld butt joints by following the steps in Resource No. 1.
3. Read Resource No. 3a and view Resource No. 3b to identify how to position and weld butt joints.
4. Position and weld butt joints by following the steps in Resource No. 3.
5. When completed, evaluate your work using the Self-Check.

   Have instructor check your work.
6. When you think you can attain this task, take the Written Test.
7. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. PAT Workbook -- Topic 16; Job Practice, page 40
2. a. Work station
   b. Tools
   c. Material: 5 pieces ¼" x 2" x 8" mild steel plate
3. a. PAT Workbook -- Topic 16; Job Practice, pages 40, 41 and 42
   b. Beseler Cue See; Topic 16
4. a. Work station
   b. Tools
   c. Materials
5. a. Self-Check enclosed.
   b. Instructor
6. Written Test for task E-15.
7. Performance Test for task E-15.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	15	1

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SELF-CHECK

RVTC

Directions

Evaluate your work using the items below.

All items should receive a "yes" response.

	YES	NO
1. Do you have 100% penetration on all welds?.....	___	___
2. Does the cover pass completely cover all of undercut left by the first pass?.....	___	___
3. Is the cover pass convex and slightly higher than the base metal?.....	___	___
4. Is the weld joint full from end to end?.....	___	___
5. Is the surface ripple of the weld beads uniform?.....	___	___

If you received a "no" response for any item go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	15	1

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WRITTEN TEST FOR TASK NO. E-15

RVTC

TASK:	Weld Butt Joints: Vertical Position

Directions

The purpose of this test is to determine if you fully understand how to weld butt joints in the vertical position. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. The plates should be butted tightly together when making a butt weld.
2. If penetration is incomplete, decrease travel speed and/or increase amperage.
3. A whipping motion to melt the edges of the plates will help you attain complete penetration.
4. When making the root pass you should use a 45° push angle.
5. The cover pass is made using a "Z-weave" or inverted "C-motion".
6. You must pause at the toe line of the previous bead to fill the undercut.
7. If the cover pass sags in the center it is because the amperage is too low.
8. Slag may be trapped in the weld if you do not come back into the puddle enough on the cover pass.
9. If you have complete penetration, the weld face does not have to be higher than the base metal.
10. The bead ripples should be 1/16" to 3/32" apart.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	15

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WRITTEN TEST FOR TASK NO. E-15

RVTC

TASK: Weld Butt Joints: Vertical Position

ANSWER KEY

Multiple Choice questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

True-False questions

T	(F)	1.	(T)	F	6.	T	F	11.	T	F	16.	T	F	21.
(T)	F	2.	T	(F)	7.	T	F	12.	T	F	17.	T	F	22.
(T)	F	3.	(T)	F	8.	T	F	13.	T	F	18.	T	F	23.
T	(F)	4.	T	(F)	9.	T	F	14.	T	F	19.	T	F	24.
(T)	F	5.	(T)	F	10.	T	F	15.	T	F	20.	T	F	25.

Matching questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	15

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PERFORMANCE TEST FOR TASK NO. E-15 RVTC

TASK:	Weld Butt Joints: Vertical Position

IN-9943-E-15

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given standard arc welding equipment and materials, you will setup, tackweld and weld a series of butt joints in the vertical position. Based upon the items below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Were the plates tackwelded according to instructions?		
2.	Did all welds have 100% penetration?		
3.	Did the cover passes completely cover all undercut?		
4.	Were the cover passes convex and slightly higher than the plate surfaces?		
5.	Were the welds free of porosity and slag inclusions?		
6.	Was all slag and weld splatter removed?		
7.	Were the weld joints full from end to end?		
8.	Was the surface ripple of the beads uniform?		
9.	Had all craters been filled?		
10.	Had all joints been welded?		

☐ ATTAINED
Score _____ ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	E	15		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-E-16

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Single and Multiple Pass Lap Joints: Overhead Position
DUTY:	Operating Shielded Metal Arc Welding Equipment

PURPOSE:

Many metal structures cannot be moved or positioned for welding. It is necessary that the welding be performed in all positions. The welder must be able to perform these welds in the overhead position.

15

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943c	E	16	E-15

REVISED :				

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, materials and a work station,

YOU WILL: setup, tackweld and weld a series of single and multiple pass lap welds in the overhead position.

You must successfully complete the Written Test.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 8.

ENABLING OBJECTIVES:

1. Weld single pass lap joints in the overhead position.
2. Weld multiple pass lap joints in the overhead position.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	16

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ENABLING OBJECTIVE NO. 1

RVTC

Weld single pass lap joints in the overhead position.

LEARNING STEPS

1. Read Resource No. 1 to determine how to tackweld a series of lap joints.
2. Tackweld lap joints by following the steps in Resource No. 1.
3. Read Resource No. 3a and view Resource No. 3b to identify how to position and weld single pass lap joints in the overhead position.
4. Position and wild single pass lap joints in the overhead position by following the steps in Resource No. 3.

   Have instructor check your work.
5. When completed, evaluate your work using the Self-Check.
6. Go on to Enabling Objective No. 2.

RESOURCES

1. PAT Workbook -- Topic 5; SMAW - B, Job Practice - Items 1 and 2, page 46.
2. a. Work station
   b. Equipment
   c. Material: 5 pieces 3/16" x 3" x 8" mild steel plate.
3. a. PAT workbook -- Topic 18; SMAW-B Job Practice - Items 1, 2 and 3, pages 46-47.
   b. Beseler Cue See; Topic 18.
4. a. Work station
   b. Tools
   c. Materials: 5 pieces 3/16" x 3" x 8" mild steel plate.
   d. Instructor
5. Self-Check enclosed.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	16	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.
All items should receive a "YES" response.

	YES	NO
1. Are the welds free of undercut?.....	___	___
2. Are the welds free of sag and roll over?.....	___	___
3. Are the weld joints filled completely?.....	___	___
4. Is the surface ripples of all weld beads uniform?.....	___	___
5. Has all slag and weld splatter been removed?.....	___	___
6. Do the welds cover the joints from end to end?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	16	1

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ENABLING OBJECTIVE NO. 2

RVTC

Weld multiple pass lap joints in the overhead position.

LEARNING STEPS

1. Read Resource No. 1 to determine how to tackweld a series of lap joints.
2. Tackweld lap joints by following the steps in Resource No. 1.
3. Read Resource No. 3 to identify how to position and weld multiple pass lap joints in the overhead position.
4. Position and weld multiple pass lap joints in the overhead position by following the steps in Resource No. 3.
5. When you think you can attain this task, take the Written Test.
6. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. PAT Workbook -- Topic 5; SMAW-B, Job Practice - Items 1 and 2, page 46.
2. a. Work station
   b. Equipment
   c. Material: 5 pieces 3/8" x 3" x 8" mild steel plate
3. PAT Workbook -- Topic 19; SMAW-B, Job Practice - Items 2 and 3, pages 48-49.
4. a. Work station
   b. Tools
   c. Materials
5. Written Test for task E-16.
6. Performance Test for task E-16.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	16	2

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WRITTEN TEST FOR TASK NO. E-16

RVTC

TASK:	Weld Single and Multiple Pass Lap Joints in the Overhead Position

Directions

The purpose of this test is to determine if you fully understand how to weld single and multiple pass lap joints in the overhead position. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. The plates should be positioned at "arms length" overhead height to weld.
2. You should lean the electrode approximately 45° in the direction of travel when welding overhead.
3. You should melt off approximately 1/16" of the bottom edge on a single pass lap weld.
4. If the puddle gets too large or too hot the weld metal will sag or fall.
5. The second pass of a multiple pass weld should be placed against the upper plate.
6. The whip and pause motion works best when overhead welding.
7. Undercutting will most likely occur on the upper plate.
8. Holding a longer arc length is necessary when welding overhead.
9. The third pass of a three pass fillet weld should be centered over the upper toe of the root pass.
10. The weld should fuse and fill the bottom edge on a multiple pass lap weld.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	16

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WRITTEN TEST FOR TASK NO. E-16

RVTC

TASK:	Weld Single and Multiple Pass Lap Joints in the Overhead Position

ANSWER KEY

Multiple Choice questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

True-False questions

T	(F)	1.	(T)	F	6.	T	F	11.	T	F	16.	T	F	21.
T	(F)	2.	(T)	F	7.	T	F	12.	T	F	17.	T	F	22.
(T)	F	3.	T	(F)	8.	T	F	13.	T	F	18.	T	F	23.
(T)	F	4.	(T)	F	9.	T	F	14.	T	F	19.	T	F	24.
T	(F)	5.	(T)	F	10.	T	F	15.	T	F	20.	T	F	25.

Matching questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	16

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PERFORMANCE TEST FOR TASK NO. E-16 RVTC

TASK:	Weld Single and Multiple Pass Lap Joints in the Overhead Position

IN-9943-E-16

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given standard arc welding equipment, metal plates and electrodes, you will make necessary setups and weld a series of single and multiple pass lap welds in the overhead position.

Based upon the items below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Were the plates overlapped approximately ½ the width when tack welded?		
2.	Were the weld joints full from end to end?		
3.	Were the throat sizes approximately equal to the thickness of the plate?		
4.	Were the leg lengths approximately equal?		
5.	Was the second pass of the multiple pass welds placed against the bottom plate?		
6.	Did the welds fuse with the bottom edge of the bottom plate without sag or rollover?		
7.	Was the surface ripple of all weld beads uniform?		
8.	Were the welds free of undercut?		
9.	Was all slag and weld splatter removed?		
10.	Were all joints welded on both sides of plates?		

Score _____ ☐ ATTAINED ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	E	16		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-E-17

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld 3 Pass and 6 Pass "Tee" Joints: Overhead Position
DUTY:	Operating Shielded Metal Arc Welding Equipment

PURPOSE:

The "tee" joint is the most common weld joint used in welding. It must be performed in all positions. Therefore, it is most important that the welder attain the competencies necessary to weld this joint in the overhead position.

16

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	E	17	E-16

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, materials and a work station,

YOU WILL: setup, tackweld and weld a series of 3 pass and 6 pass "tee" joints in the overhead position.

HOW WELL: You must successfully complete the Written Test.
Your performance will be assessed by your instructor using the Performance Test on page 10.

ENABLING OBJECTIVES:

1. Setup, tackweld and weld 3 pass "tee" joints in the overhead position.
2. Setup, tackweld and weld 6 pass "tee" joints in the overhead position.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	17

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ENABLING OBJECTIVE NO. 1

RVTC

Setup, tackweld and weld 3 pass "tee" joints in the overhead position.

LEARNING STEPS

1. Read Resource No. 1 to determine how to setup and tackweld "tee" joints.
2. Setup and tackweld "tee" joints by following the directions in Resource No. 1.
3. Read Resource No. 3a and view Resource No. 3b to determine how to weld a 3 pass "tee" joint in the overhead position.
4. Position and weld 3 pass "tee" joints in the overhead position by following the directions in Resource No. 3.

   Have instructor check your work.
5. When completed, evaluate your work using the Self-Check.
6. Go on to Enabling Objective No. 2.

RESOURCES

1. PAT Workbook -- Topic 8; SMAW-B, Job Practice, Item 2, page 20.
2. a. Work station
   b. Tools
   c. Material: 5 pieces ¼" x 3" x 8" mild steel plate.
3. a. PAT Workbook -- Topic 19; SMAW-B, Job Practice, Items 2 and 3, pages 48-49.
   b. Beseler Cue See; Topic 19.
4. a. Work station
   b. Tools
   c. Materials: tackwelded "tee" joints
   d. Instructor
5. Self-Check enclosed.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	17	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.
All items should receive a "YES" response.

		YES	NO
1.	Are the leg lengths of the welds approximately equal?..	___	___
2.	Are the welds free of undercut?.....	___	___
3.	Do the weld beads overlap without rolling over?.....	___	___
4.	Do the welds have a uniform surface ripple?.....	___	___
5.	Are the welds free of slag entrapment and porosity?....	___	___
6.	Are the weld joints full from end to end?.....	___	___
7.	Have you removed all of the weld splatter?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	17	1

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ENABLING OBJECTIVE NO. 2

RVTC

Setup, tackweld and weld 6 pass "tee" joints in the overhead position.

LEARNING STEPS

1. Read Resource No. 1 to determine the weld bead sequence when welding a 6 pass "tee" joint.
2. Make 6 pass "tee" joints by following the steps in Resource No. 1.
3. When completed, evaluate your work using the Self-Check.
4. When you think you can attain this task, take the Written Test.
5. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. Instruction Sheet enclosed, Positioning Weld Bead Sequence for 6 Pass "Tee" Joints in the Overhead Position
2. a. Work station
   b. Tools
   c. Material: 5 pieces ¼" x 3" x 8" mild steel plate
3. Self-Check enclosed.
4. Written Test for task E-17.
5. Performance Test for task E-17.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	17	2

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INSTRUCTION SHEET

RVTC

Positioning Weld Bead Sequence for 6 Pass "Tee" Joints in the Overhead Position

1. Tackweld 5 plates to form 8 "tee" joints. (Figure No. 1)
2. Position and clamp in fixture for overhead welding. (Figure No. 1)
3. Deposit first three beads as you did in Enabling Objective No. 1.
4. Starting on bottom plate, deposit three more weld beads.
5. Weld remaining seven "tee" joints using same procedure.

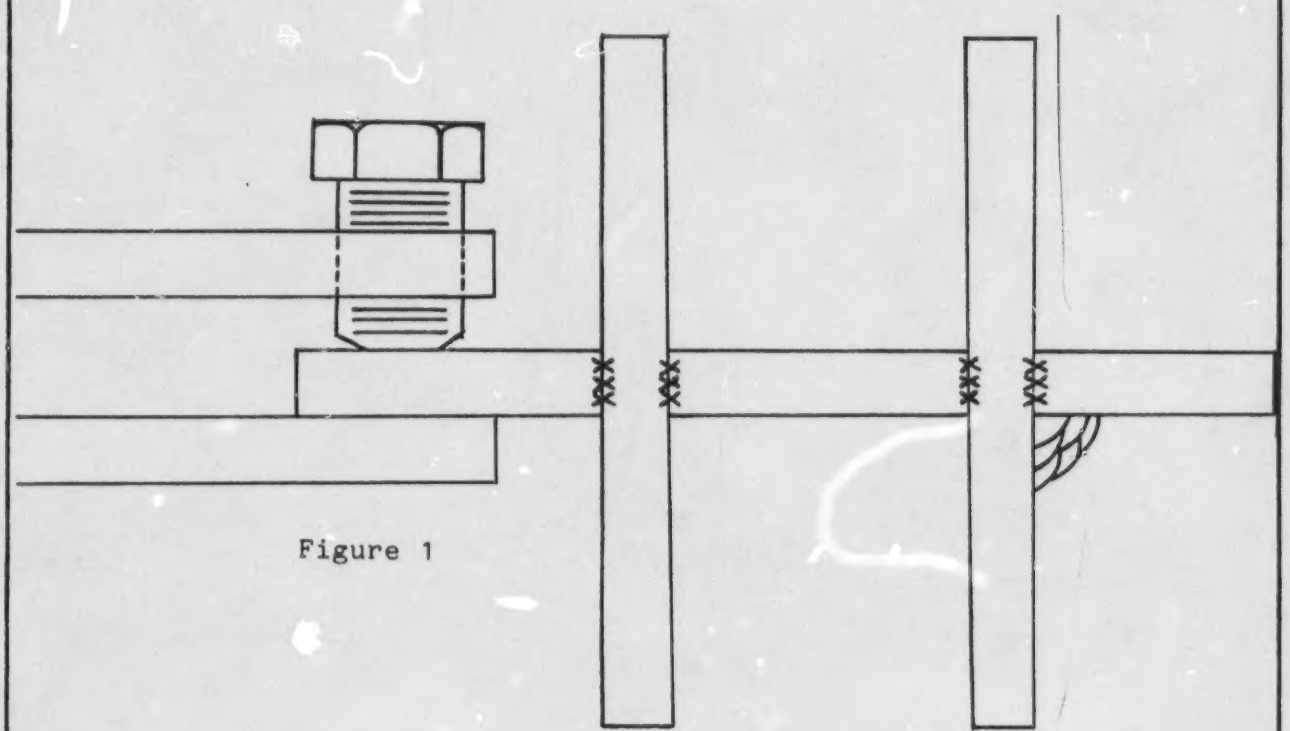

Figure 1

DEPT.	PROG.	DUTY	TASK	EN OBJ.
IN	9943	E	17	2

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "YES" response.

		YES	NO
1.	Are the leg lengths of the welds approximately equal?..	___	___
2.	Are the welds free of undercut?.....	___	___
3.	Do the weld beads overlap without rolling over?.....	___	___
4.	Do the welds have a uniform surface ripple?.....	___	___
5.	Are the welds free of slag entrapment and porosity?....	___	___
6.	Are the weld joints full from end to end?.....	___	___
7.	Have you removed all of the weld splatter?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	17	2

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WRITTEN TEST FOR TASK NO. E-17

RVTC

TASK:	Weld 3 Pass and 6 Pass "Tee" Joints in the Overhead Position

IN-9943-E-17

Directions

The purpose of this test is to determine if you fully understand how to weld 3 pass and 6 pass "tee" joints in the overhead position. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. The weld bead sequence should be from the lower plate to the upper plate when welding overhead.
2. A "cold start" at the beginning of the weld bead can be eliminated by striking the arc ahead and quickly moving back to the beginning point.
3. By carrying a larger puddle, you can prevent weld bead sag when welding overhead.
4. Incorrect electrode angle may cause the weld bead to roll over at the toe.
5. Undercutting the upper plate is a major problem when welding "tee" joints overhead.
6. The leg length should be longer on the lower plate of a "tee" joint overhead.
7. It is usually necessary to lower your amperage when welding overhead.
8. The second pass of a 3 pass "tee" joint should be centered over the lower toe of the root pass.
9. You should lean the electrode 10° to 15° in the direction of travel when welding overhead.
10. Overhead position means over your head when standing.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	17

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WRITTEN TEST FOR TASK NO. E-17

RVTC

TASK:	Weld 3 Pass and 6 Pass "Tee" Joints in the Overhead Position

ANSWER KEY

PAGE 1 OF 1

Multiple Choice questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

True-False questions

(T) F 1.	T (F) 6.	T F 11.	T F 16.	T F 21.
(T) F 2.	T (F) 7.	T F 12.	T F 17.	T F 22.
T (F) 3.	(T) F 8.	T F 13.	T F 18.	T F 23.
(T) F 4.	(T) F 9.	T F 14.	T F 19.	T F 24.
(T) F 5.	T (F) 10.	T F 15.	T F 20.	T F 25.

Matching questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	17

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PERFORMANCE TEST FOR TASK NO. E-17

RVTC

IN-9943-E-17

TASK:	Weld 3 Pass and 6 Pass "Tee" Joints in the Overhead Position

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given standard arc welding equipment, tools and materials, you will make the necessary setups and weld both 3 pass and 6 pass "tee" joints in the overhead position. Based upon the items below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Were the welds free of undercut, porosity and slag entrapment?		
2.	Were the joints welded from end to end without "cold starts"?		
3.	Were the leg lengths approximately equal?		
4.	Were the weld beads overlapped without rollover?		
5.	Were the weld beads deposited in the proper sequence?		
6.	Was the surface ripple of the weld beads uniform?		
7.	Had all of the slag and weld splatter been removed?		
8.	Were the weld faces slightly convex rather than concave?		
9.	Was distortion held to a minimum?		
10.	Were all joints welded?		

☐ ATTAINED

Score _____ ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	E	17		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-E-18

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Outside Corner Joints: Overhead Position
DUTY:	Operating Shielded Metal Arc Welding Equipments

PURPOSE:

The outside corner joint is widely used in the fabrication of tanks, containers and other structural forms. It is essential that you attain the skills needed to perform this weld in the overhead position.

17

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	E	18	

REVISED				

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, metal and a work station,

YOU WILL: tack weld, position and weld outside corner joints in the overhead position.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 8.

NOTE:

IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Weld outside corner joints in the overhead position.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	18

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ENABLING OBJECTIVE NO. 1

RVTC

Weld outside corner joints in the overhead position.

LEARNING STEPS

1. Read Resource No. 1 to determine how to tack weld plates for outside corner joints.
2. Tack weld plates by following the steps in Resource No. 1.
3. Read Resource No. 3 to determine how to position outside corner joints in the overhead position.
4. Position outside corner joints by following the steps in Resource No. 3.
5. Read Resource No. 5 to determine weld bead sequence for outside corner joints in the overhead position.
6. Weld outside corner joints by following the steps in Resource No. 5.

   Have instructor check your work.
7. When completed, evaluate your work using the Self-Check.
8. When you think you can perform this task, take the Performance Test.

RESOURCES

1. Instruction Sheet enclosed, Tackwelding Outside Corner Joints
2. a. Work station
   b. Tools
   c. Materials: 4 pieces ½" x 2" x 8" mild steel plate
3. Instruction Sheet enclosed, Positioning Outside Corner Joints: Overhead Position
4. a. Work station
   b. Tackwelded assemblies
5. Instruction Sheet enclosed, Weld Bead Sequence for Outside Corner Joints: Overhead Position
6. a. Work station
   b. Tackwelded assemblies
   c. Instructor
7. Self-Check enclosed.
8. Performance Test for task E-18.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	18	1

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INSTRUCTION SHEET

RVTC

Tackwelding Outside Corner Joints

1. Position plates to leave approximately 1/16" space as shown in Figure 1.
2. Tack weld on inside of angle approximately ½" from each end.

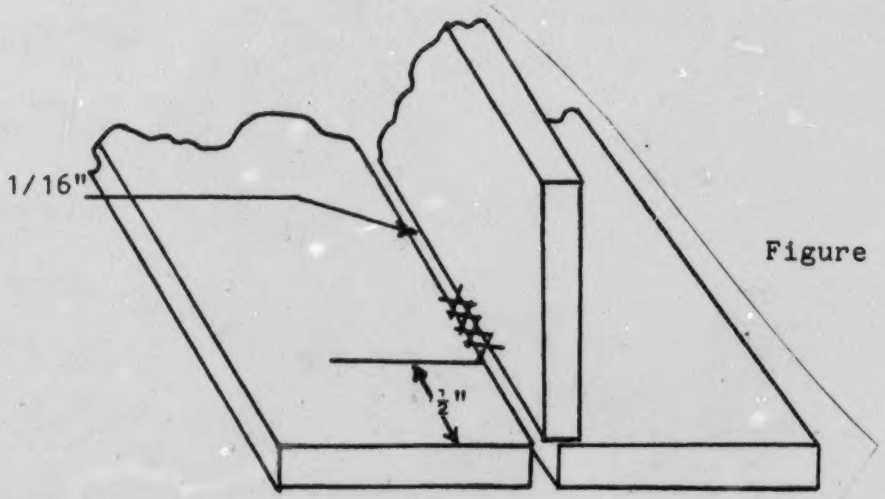

Figure 1

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	18	1

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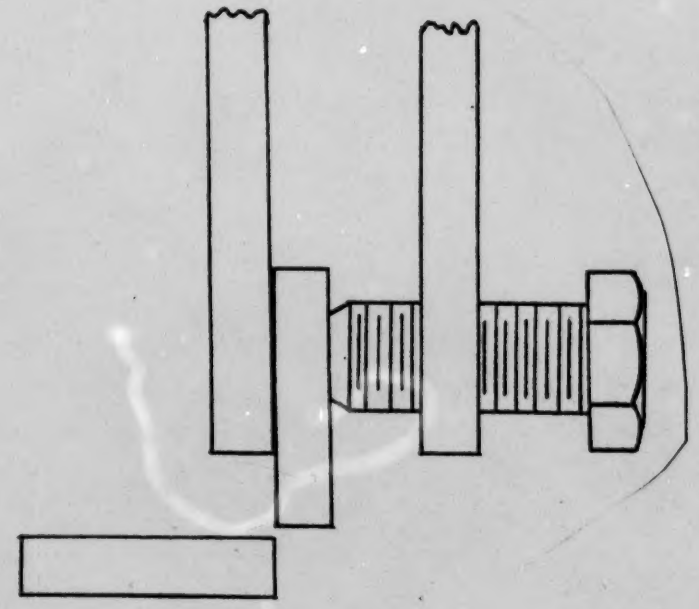
INSTRUCTION SHEET

RVTC

Positioning Outside Corner Joints: Overhead Position



DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	18	1

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INSTRUCTION SHEET

RVTC

Weld Bead Sequence for Outside Corner Joints: Overhead Position

1. Deposit the root pass. You should have 100% penetration. See Figure 1.
2. Deposit the second pass against the lower part of the weld joint. You should overlap more than ½ of the root pass. See Figure 2.
3. Deposit the third pass by overlapping the second pass and fusing with the upper section of the weld joint. See Figure 3.
4. Additional layers of weld beads may be necessary to make sure the weld joint is full and slightly rounded. Deposit these beads from bottom to top of weld joint.

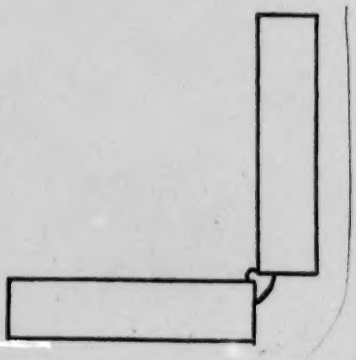

Figure 1

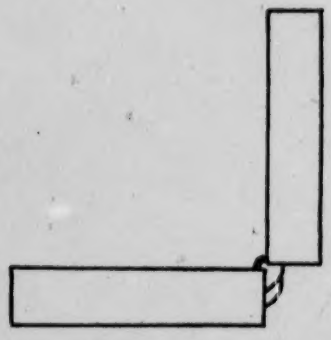

Figure 2

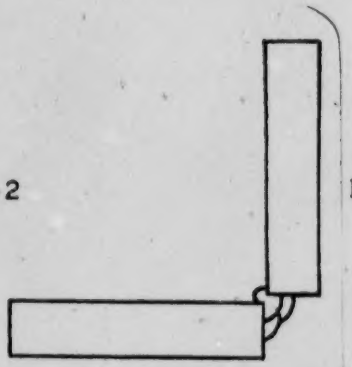

Figure 3

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	18	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

		YES	NO
1.	Did the finished welds have 100% penetration?.....	___	___
2.	Were the throat sizes at least as thick as the base metal?.....	___	___
3.	Were the welds free of porosity and slag inclusions?....	___	___
4.	Was the surface ripple uniform on all weld beads?.....	___	___
5.	Were the weld joints full and slightly rounded?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	18	1

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PERFORMANCE TEST FOR TASK NO. E-18

RVTC

TASK: Weld Outside Corner Joints: Overhead Position

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given standard metal arc equipment, four metal plates and electrodes, you will make the necessary setups and weld two outside corner joints in the overhead position. Based upon the items listed below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Did both weld joints have 100% penetration?		
2.	Were the weld joints full and weld faces slightly rounded?		
3.	Was the surface ripple of all beads uniform?		
4.	Were the welds free of porosity and slag inclusions?		
5.	Were the weld joints full from end to end?		
6.	Was there an absence of "roll over" between weld beads?		
7.	Did the weld beads overlap without leaving a valley?		
8.	Was there a minimum of undercut along the weld edges?		
9.	Was all slag and weld splatter removed?		
10.	Were all craters filled?		

Score _____ ☐ ATTAINED ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	E	18		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-E-19

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Butt Joints: Overhead Position
DUTY:	Operating Shielded Metal Arc Welding Equipment

PURPOSE:

The butt weld is a common weld joint used in welded fabrications. It is important that you attain the necessary skills to perform this weld in the overhead position.

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DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	E	19	E-18

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, metal and a work station,

YOU WILL: setup, tack weld and weld a series of butt welds in the overhead position.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 5.

ENABLING OBJECTIVES:

1. Setup, tack weld and weld a series of butt welds in the overhead position.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	19

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ENABLING OBJECTIVE NO. 1

RVTC

Setup, tack weld and weld a series of butt welds in the overhead position.

LEARNING STEPS

1. Read Resource No. 1 to determine how to tack weld butt joints.
2. Tack weld a series of butt joints by following the steps in Resource No. 1.
3. Read Resource No. 3a and view Resource No. 3b showing how to position and weld butt joints in the overhead position.
4. Practice welding butt joints in the overhead position by following the steps in Resource No. 3.
5. When completed, evaluate your work using the Self-Check.

   Have your instructor check your work.
6. When you think you can perform this task, take the Performance Test.

RESOURCES

1. PAT Workbook SMAW-B: Job Practice; Topic 21, page 52.
2. a. Work station
   b. Tools
   c. Materials: 3 pieces 3/16" x 2" x 8" mild steel plate.
3. a. PAT Workbook SMAW-B: Job Practice; Topic 21, pages 52-55.
   b. Beseler Cue See; Topic 21.
4. a. Work station
   b. Tools
   c. Tackwelded assemblies
5. a. Self-Check enclosed.
   b. Instructor
6. Performance Test for task E-19.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	19	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
1. Did you have 100% penetration on all welds?.....	___	___
2. Did the cover passes completely cover all of the undercut left by the first pass?.....	___	___
3. Was the weld face full and slightly convex?.....	___	___
4. Was the surface ripple of the weld beads uniform?.....	___	___
5. Was all slag and weld splatter removed?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	19	1

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PERFORMANCE TEST FOR TASK NO. E-19 | RVTC

IN-9943-E-19

TASK: Weld Butt Joints: Overhead Position

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given a work station and material, you will setup, tack weld and weld two butt welds in the overhead position. Your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED: For successful attainment ALL items must receive a "YES" response.	YES	NO
1.	Were the plates tackwelded according to instructions?		
2.	Did the welds have 100% penetration?		
3.	Were the cover passes free of undercut?		
4.	Were the cover passes full and slightly convex?		
5.	Were the welds free of porosity?		
6.	Was all slag and weld splatter removed?		
7.	Was the surface ripple of the weld beads uniform?		
8.	Were the weld joints full from end to end?		
9.	If overlapping weld beads were used for the cover passes, were the beads overlapped approximately ½ width of bead?		
10.	Was the work station secured?		

Score _____ ☐ ATTAINED ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	E	19		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-E-20

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld with Low Hydrogen Electrodes
DUTY:	Operating Shielded Metal Arc Welding Equipment

PURPOSE:

The low hydrogen electrode is used extensively in welding because of its resistance to cracking on the high carbon steels and its higher deposition rate. It is most important that you become competent in the use of these electrodes.

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DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	E	20	E-19

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, metal and a work station,

YOU WILL: setup and weld a series of weld joints using low hydrogen electrodes.

HOW WELL: You must successfully complete the Written Test.
Your performance will be assessed by your instructor using the Performance Test on page 8.

NOTE:
IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Weld 3-pass "tee" joints in the vertical up position using low hydrogen electrodes.
2. Weld 3-pass "tee" joints in the overhead position using low hydrogen electrodes.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	20

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ENABLING OBJECTIVE NO. 1

RVTC

Weld 3-pass "tee" joints in the vertical up position using low hydrogen electrodes.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine the proper electrode manipulation to deposit a sound 3-pass fillet weld.
2. Practice welding 3-pass fillet welds by following the steps in Resource No. 1.

   Have instructor check your work.
3. When completed, evaluate your work using the Self-Check.
4. Go on to Enabling Objective No. 2.

RESOURCES

1. a. PAT Workbook SMAW-B: Job Practice; topic 30, pages 77-81.
   b. Beseler Cue See: topic 30.
2. a. Work station
   b. Tools
   c. 1/8" E-7018 electrodes
   d. Materials:
      a. 1 piece 1/4" x 4" x 8" mild steel plate
      b. 2 pieces 1/4" x 2" x 8" mild steel plate
   e. Instructor
3. Self-Check enclosed.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	20	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.
All items should receive a "yes" response.

	YES	NO
1. Were the weld beads free of porosity and slag inclusions?.....	___	___
2. Were the weld faces slightly convex?.....	___	___
3. Were the welds free of valleys between weld beads?.....	___	___
4. Was the surface ripple of the welds uniform?.....	___	___
5. Were the leg lengths approximately equal?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	20	1

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ENABLING OBJECTIVE NO. 2

RVTC

Weld 3-pass "tee" joints in the overhead position using low hydrogen electrodes.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to deposit a 3-pass fillet weld in the overhead position.
2. Practice welding 3-pass fillet welds in the overhead position by following the steps in Resource No. 1.
3. When you think you can attain this task, take the Written Test.
4. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. a. PAT Workbook SMAW-B: Job Practice; topic 31, pages 82-83.
   b. Beseler Cue See: topic 31.
2. a. Work station
   b. Tools
   c. 1/8" E-7018 electrodes
   d. Materials:
      a. 1 piece 1/4" x 4" x 8" mild steel plate
      b. 2 pieces 1/4" x 2" x 8" mild steel plate
   e. Instructor
3. Written Test for task E-20.
4. Performance Test for task E-20.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	20	2

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WRITTEN TEST FOR TASK NO. E-20

RVTC

IN-9943-E-20

TASK: Weld with Low Hydrogen Electrodes

Directions

The purpose of this test is to determine if you fully understand how to weld with low hydrogen electrodes. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle the T if the item is True and the F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. Straight polarity is used to weld low hydrogen electrodes.
2. You need higher amperage to weld low hydrogen than you use for mild steel electrodes.
3. An inverted V-weave motion is recommended for the root pass.
4. Porosity and narrow high crowned beads may result from too long an arc, traveling too fast, or amperage being too long.
5. Increasing the electrode angle as you travel upward will help you control the puddle.
6. Pausing at the toe line when making a weave bead will help make a crown at the center of the bead.
7. The slag should form a high crown at the center of the weld bead.
8. Vertical up welding is not as strong as vertical down.
9. The root pass with low hydrogen electrodes should be slightly larger than the next two passes.
10. Holding a long arc (more than 1/8") will help you control the puddle.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	20

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WRITTEN TEST FOR TASK NO. E-20

RVTC

TASK: Weld with Low Hydrogen Electrodes

ANSWER KEY

Multiple Choice questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

True-False questions

T (F) 1.	(T) F 6.	T F 11.	T F 16.	T F 21.
(T) F 2.	(T) F 7.	T F 12.	T F 17.	T F 22.
(T) F 3.	T (F) 8.	T F 13.	T F 18.	T F 23.
(T) F 4.	(T) F 9.	T F 14.	T F 19.	T F 24.
T (F) 5.	T (F) 10.	T F 15.	T F 20.	T F 25.

Matching questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	20

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PERFORMANCE TEST FOR TASK NO. E-20

RVTC

TASK: Weld with Low Hydrogen Electrodes

IN-9943-E-20

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given standard arc welding equipment, metal plates and low hydrogen electrodes, you will make the necessary setups and weld four 3-pass "tee" joints in the vertical position on the same workpiece. Your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Were the plates tackwelded to form a cross?.....	....	....
2.	Were the welds sequenced to hold distortion to a minimum?.....	....	....
3.	Were the leg lengths approximately equal on each weld?.....	....	....
4.	Were the weld faces slightly convex without sagging?.	....	....
5.	Were the welds free of undercut, porosity and slag inclusions?.....	....	....
6.	Were the throat sizes more than 1/4"?.....	....	....
7.	Was all weld splatter removed?.....	....	....
8.	Were all joints welded?.....	....	....

☐ ATTAINED
Score _____ ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	E	20		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-E-21

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Vee-Bend Test Plates in All Positions
DUTY:	Operating Shielded Metal Arc Welding Equipment

PURPOSE:

Many employers require welders to pass the guided bend tests in all positions. To prepare for this, you must become competent in welding vee-bend test plates.

20

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	E	21	E-20

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, materials and a work station,

YOU WILL: weld a series of vee-bend test plates in all positions and prepare and bend test samples.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 7.

NOTE:

IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Weld vee-bend test plates in the flat position, prepare and bend test samples.
2. Weld vee-bend test plates in the horizontal position, prepare and bend test samples.
3. Weld vee-bend test plates in the vertical up position, prepare and bend test samples.
4. Weld vee-bend test plates in the overhead position, prepare and bend test samples.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	21

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ENABLING OBJECTIVE NO. 1

RVTC

Weld vee-bend test plates in the flat position, prepare and bend test samples.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to weld vee-bend test plates in the flat position.
2. Weld vee-bend test plates in the flat position by following the steps in Resource No. 1.

   Have instructor check your work.
3. Read Resource No. 3 to determine how to prepare and bend test samples.
4. Prepare and bend test samples by following the steps in Resource No. 3.

   Have instructor check your work.
5. When you attain the standard of acceptability outlined in Resource No. 5, go on to Enabling Objective No. 2.

RESOURCES

1. a. PAT Workbook SMAW-A: Job Practice; topic 18, pages 44-46.
   b. Beseler Cue See: topic 18.
2. a. Work station
   b. Tools
   c. Materials: 3/8" x 4" x 8" beveled plate
   d. Instructor
3. PAT Workbook SMAW-A: Job Practice; topic 16, pages 40-41.
4. a. Work station
   b. Tools
   c. Welded test plates
   d. Bend test fixture
   e. Instructor
5. PAT Workbook SMAW-A: Job Practice; topic 16, page 41.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	21	1

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ENABLING OBJECTIVE NO. 2

RVTC

Weld vee-bend test plates in the horizontal position, prepare and bend test samples.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to weld vee-bend test plates in the horizontal position.
2. Weld vee-bend test plates in the horizontal position by following the steps in Resource No. 1.

   Have instructor check your work.
3. Read Resource No. 3 to determine how to prepare and bend test samples.
4. Prepare and bend test samples by following the steps in Resource No. 3.

   Have instructor check your work.
5. When you attain the standard of acceptability outlined in Resource No. 5, go on to Enabling Objective No. 3.

RESOURCES

1. a. PAT Workbook SMAW-A: Job Practice; topic 11, pages 25-29.

   B. Beseler Cue See: topic 11
2. a. Work station

   b. Tools

   c. Materials: 3/8" x 4" x 8" beveled plate

   d. Instructor
3. PAT Workbook SMAW-A: Job Practice; topic 13; pages 33-34.
4. a. Work station

   b. Tools

   c. Welded test plate

   d. Bend test fixture

   e. Instructor
5. PAT Workbook SMAW-A: Job Practice, topic 13, page 34.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	21	2

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ENABLING OBJECTIVE NO. 3

RVTC

Weld vee-bend test plates in the vertical up position, prepare and bend test samples.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to weld vee-bend test plates in the vertical up position.
2. Weld vee-bend test plates in the vertical up position by following the steps in Resource No. 1.

   Have instructor check your work.
3. Read Resource No. 3 to determine how to prepare and bend test samples.
4. Prepare and bend test samples by following the steps in Resource No. 3.

   Have instructor check your work.
5. When you attain the standard of acceptability outlined in Resource No. 5, go on to Enabling Objective No. 4.

RESOURCES

1. a. PAT Workbook SMAW-A: Job Practice; topic 15, pages 37-39.
   b. Beseler Cue See: topic 15
2. a. Work station
   b. Tools
   c. Materials: 3/8" x 4" x 8" beveled plate
   d. Instructor
3. PAT Workbook SMAW-A: Job Practice; topic 13, pages 33-34.
4. a. Work station
   b. Tools
   c. Welded test plate
   d. Bend test fixture
   e. Instructor
5. PAT Workbook SMAW-A: Job Practice; topic 13, page 34.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	21	3

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ENABLING OBJECTIVE NO. 4

RVTC

Weld vee-bend test plates in the overhead position, prepare and bend test samples.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to weld vee-bend test plates in the overhead position.
2. Weld vee-bend test plates in the overhead position by following the steps in Resource No. 1.

   Have instructor check your work.
3. Read Resource No. 3 to determine how to prepare and bend test samples.
4. Prepare and bend test samples by following the steps in Resource No. 3.

   Have instructor check your work.
5. When you attain the standard of acceptability outlined in Resource No. 5, check with your instructor for your next assignment.

RESOURCES

1. a. PAT Workbook SMAW-A: Job Practice; topic 12, pages 30-32.
   b. Beseler Cue See: topic 12
2. a. Work station
   b. Tools
   c. Materials: 3/8" x 4" x 8" beveled plate
   d. Instructor
3. PAT Workbook SMAW-A: Job Practice; topic 13; pages 33-34.
4. a. Work station
   b. Tools
   c. Welded test plate
   d. Bend test fixture
   e. Instructor
5. PAT Workbook SMAW-A: Job Practice; topic 13, page 34.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	21	4

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PERFORMANCE TEST FOR TASK NO. E-21 | RVTC

IN-9943-E-21

TASK:	Weld Vee-Bend Test Plates in All Positions

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given standard metal arc welding equipment, electrodes and beveled test plates, you will make the necessary setups, weld, prepare and bend test smaples - both root bend and face bend in all positions. This test is similar to welder certification tests required for many welding jobs. Based upon the items listed below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Were the bend test pieces 1 1/2" in width?.....		
2.	Were the bend test pieces 3/8" thick at weld area?.....		
3.	Did the grind marks run lengthwise with the pieces?.....		
4.	Did the corners have a radius ground on them?.....		
5.	Were the test pieces identified for root and face?.....		
6.	Did all of the test pieces bend with no open defects exceeding 1/8" measured in any direction?.....		

Score _____ ☐ ATTAINED ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	E	21		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-E-22

WELDING

A STUDENT LEARNING GUIDE

TASK:	Finish Metal Surfaces With Hand Tools
DUTY:	Operating Shielded Metal Arc Welding Equipment

PURPOSE:

It is most important that guided bend test samples be finished per instructions in this Learning Guide to prepare them for bend testing in the following Learning Guide.

DEPT.	PROG.	DUTY	TASK	PRE RE	REVISED
IN	9943	E	22	E-2	

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: tools and weld samples,

YOU WILL: oxy-acetylene cut samples to width and grind four surfaces.

HOW WELL: You must successfully complete the Written Test.

ENABLING OBJECTIVES:

1. Obtain equipment, tools and welded samples.
2. Layout and oxy-acetylene cut samples to width.
3. Finish grind surfaces.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	22

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ENABLING OBJECTIVE NO. 1

RVTC

Obtain equipment, tools and welded samples.

LEARNING STEPS

1. Read Resource No. 1 to identify equipment, tools and welded samples needed.
2. Assemble equipment, tools and weld pieces listed in Resource No.1 at your work station.
3. Go on to Enabling Objective No. 2.

RESOURCES

1. Instruction Sheet enclosed, Finish Grinding Equipment
2. a. Equipment
   b. Tools
   c. Welded pieces
   d. Work station

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	22	1

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INSTRUCTION SHEET

RVTC

Finish Grinding Equipment

1. Obtain from tool crib:
   a. 1 - disc grinder
   b. 1 - "c" clamp
   c. 1 set metal stamp letters
   d. 1 - ball peen hammer
   e. 1 - metal punch
   f. 1 - 12' metal tape rule
2. Obtain welded test plates.
   CAUTION: CHECK GRINDING DISC TO BE SURE IT IS IN SAFE, USABLE CONDITION!

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	22	1

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ENABLING OBJECTIVE NO. 2

RVTC

Layout and oxy-acetylene cut samples to width.

LEARNING STEPS

1. Read Resource No. 1 to determine how to layout and oxy-acetylene cut samples to width.
2. Layout and oxy-acetylene cut test samples by following the steps in Resource No. 1.
3. Evaluate your work by completing the Self-Check.

   Have instructor check your work.
4. Go on to Enabling Objective No. 3.

RESOURCES

1. Instruction Sheet enclosed, Laying Out and Cutting Weld Samples
2. a. Work station
   b. Hand tools
   c. Metal stamp letters
   d. Welded test plates
3. a. Self-Check enclosed.
   b. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	22	2

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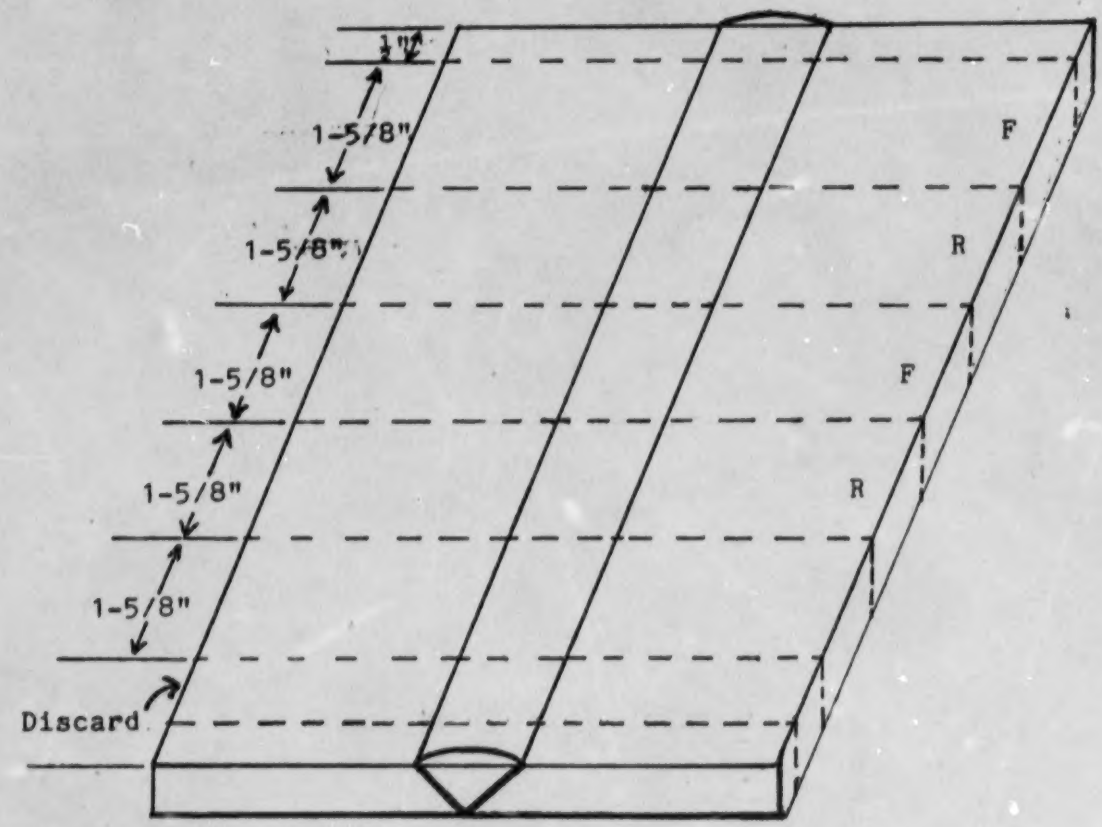
INSTRUCTION SHEET

RVTC

Laying Out and Cutting Weld Samples

1. Layout and cut weld samples to width per sketch.
   Discard the first ½" wide section and remaining ½" wide section.

   a. Layout and mark with soapstone; then use metal punch to remark lines.



   b. Oxy-acetylene cut pieces on marks. Pieces will finish approximately 1½" wide.

   c. Metal stamp "F" or "R" on pieces (F=face, R=root).

DEPT.	PROG	DUTY	TASK	EN. OBJ.
IN	9943	E	22	2

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below:

All items should receive a "yes" response.

		YES	NO
1.	Are all of the test samples approximately 1½" wide?...	___	___
2.	Are the "cut" edges fairly smooth and not jagged?.....	___	___
3.	Have you metal stamped an "F" for face and an "R" for root on alternate pieces?.....	___	___
4.	Did you put your discards in the proper scrap container?.....	___	___

If you received a "no" response for any item go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	22	2

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ENABLING OBJECTIVE NO. 3

RVTC

Finish grind surfaces.

LEARNING STEPS

1. Read Resource No. 1 to determine how to grind samples.
2. Finish grind samples by following the steps in Resource No. 1.
3. When you think you can attain this task, take the Written Test.

RESOURCES

1. Instruction Sheet enclosed, Finishing Grind Test Samples
2. a. Work station
   b. Test samples
   c. Eye protective equipment
   d. Hand tools
   e. Disc grinder
3. Written Test for task E-22.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	E	22	3

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INSTRUCTION SHEET

RVTC

Finishing Grind Test Samples

CAUTION: USE PORTABLE SHIELDS TO PREVENT INJURY TO OTHERS!

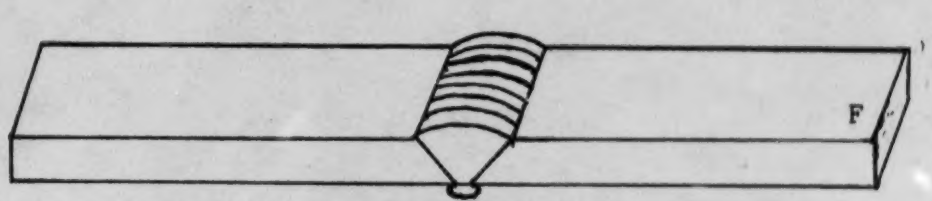
A. Weld area and any slag from cutting must be ground smooth with base metal.

B. All corners must be broken (radius approximately 1/16").

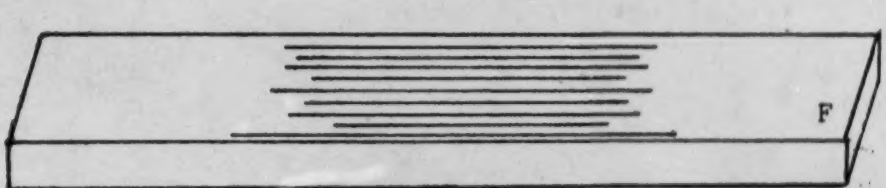
C. Grind marks must run lengthways with sample.

D. Weld area cannot be ground thinner or narrower than sample (3/8" thick x 1-1/2" wide).

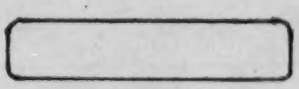
NOTE: DO NOT GRIND OFF IDENTIFYING METAL STAMP MARKS!



Sample before grinding



Sample after grinding showing direction of grind marks



End View showing radius on corners

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	E	22	3

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WRITTEN TEST FOR TASK NO. E-22

RVTC

TASK:	Finish Metal Surfaces With Hand Tools

IN-9943-E-22

Directions

The purpose of this test is to determine if you fully understand how to finish metal surfaces with hand tools. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. It is not necessary to use eye protection when using a disc grinder.
2. Soapstone marks may burn off when oxy-acetylene cutting.
3. You measure 1-5/8" in from one edge to make your first mark when laying out pieces for cutting.
4. It is ok to grind the weld area narrower than the rest of the sample to grind out a defect.
5. The marks left by the grinding disc must run lengthways with the sample.
6. All four edges must be "broken".

DEPT.	PROG.	DUTY	TASK
IN	9943	E	22

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WRITTEN TEST FOR TASK NO. E-22

RVTC

TASK: Finish Metal Surfaces With Hand Tools

ANSWER KEY

Multiple Choice questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

True-False questions

T (F) 1.	(T) F 6.	T F 11.	T F 16.	T F 21.
(T) F 2.	T F 7.	T F 12.	T F 17.	T F 22.
T (F) 3.	T F 8.	T F 13.	T F 18.	T F 23.
T (F) 4.	T F 9.	T F 14.	T F 19.	T F 24.
(T) F 5.	T F 10.	T F 15.	T F 20.	T F 25.

Matching questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

DEPT.	PROG.	DUTY	TASK
IN	9943	E	22

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IN-9943-F-01

WELDING

A STUDENT LEARNING GUIDE

TASK:	Assemble Tig Torch and Prepare to Tig Weld
DUTY:	Operating Gas Shielded arc Welding Equipment

PURPOSE:

This task is basic to all gas tungsten arc welding tasks. It is most important that you understand how to assemble the tig torch and prepare the equipment in a safe and efficient manner.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	F	01	

REVISED				

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment and a work station,

YOU WILL: assemble the tig torch and prepare the equipment for gas tungsten arc welding.

You must successfully complete the Written Test.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 15.

ENABLING OBJECTIVES:

1. Define the welding terms used in this Learning Guide.
2. Obtain equipment and take to work station.
3. Assemble tig torch and prepare equipment for gas tungsten arc welding.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	01

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ENABLING OBJECTIVE NO. 1

RVTC

Define the welding terms used in this Learning Guide.

LEARNING STEPS

1. Read Resource No. 1 to define the welding terms used in this Learning Guide. Study these terms until you can remember them.
2. Evaluate your attainment of these terms by completing the Self-Check.
3. Go on to Enabling Objective No. 2.

RESOURCES

1. Instruction Sheet enclosed, Welding Terms - Gas Tungsten Arc Welding
2. Self-Check enclosed.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	01	1

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INSTRUCTION SHEET

RVTC

Welding Terms - Gas Tungsten Arc Welding

1. Tungsten Electrode -- A non-filler metal electrode, used in arc welding, made principally of tungsten.

2. Gas Tungsten Arc Welding -- An arc welding process where the heat is transferred between a tungsten (non-consumable) electrode and the work under a shield of inert gas. This process is commonly called tig welding.

3. Inert Gas -- A gas that does not normally combine chemically with the base or filler metal (argon and helim are two types of inert gases).

4. Heat Affected Zone -- That portion of the base metal which has not been melted, but whose mechanical properties have been altered by the heat of welding.

5. Pass -- A single longitudinal progression of a welding operation. The result is a weld bead.

6. Shielding Gas -- Protective gas used to prevent atmospheric contamination.

7. Thoriated Tungsten -- A thorium alloyed tungsten (1% or 2%) used with DCSP (direct current straight polarity). The color code is yellow or red.

8. Alloy -- A mixture of two or more metals.

9. Pure Tungsten -- An all tungsten electrode used with AC (alternating current). The color code is green.

DEPT.	PROG	DUTY	TASK	EN. OBJ.
IN	9943	F	01	1

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SELF-CHECK

RVTC

Directions

Evaluate your attainment of the Welding terms by completing the following items.

On the line to the left of each item in Column A, write in the letter of the item in Column B that best identifies each definition given in Column A. Every item in Column B does not have to be used.

	A	B
_____ 1.	A non-filler metal electrode used in arc welding, made primarily of tungsten.	a. alloy
_____ 2.	An arc welding process where the heat is transferred between a tungsten electrode and the work under a shield of inert gas.	b. pass
_____ 3.	A gas that does not normally combine chemically with the base or filler metal.	c. joint
_____ 4.	That portion of the base metal which has not been melted but whose mechanical properties have been altered by the heat of welding.	d. thoriated tungsten
_____ 5.	A single longitudinal progression of a welding operation.	e. pure tungsten
_____ 6.	Protective gas used to prevent atmospheric contamination.	f. inert gas
_____ 7.	A tungsten electrode used with DCSP.	g. tungsten electrode
_____ 8.	A mixture of two or more metals.	h. shielding gas
_____ 9.	A tungsten electrode used with AC.	i. heat affected zone
		j. gas tungsten arc welding
		k. bead

Now check your answers with the Answer Key.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	F	01	1

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SELF-CHECK

RVTC

Answer Key

g 1.

j 2.

f 3.

i 4.

b 5.

h 6.

d 7.

a 8.

e 9.

All of your answers should agree with the answers in the Answer Key. If you missed any, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	F	01	1

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ENABLING OBJECTIVE NO. 2

RVTC

Obtain equipment and take to work station.

LEARNING STEPS

1. Read Resource No. 1 to identify equipment needed.
2. Assemble equipment at work station listed in Resource No. 1.
3. Go on to Enabling Objective No. 3.

RESOURCES

1. Instruction Sheet enclosed, Tig Welding Equipment
2. a. Equipment
   b. Work station

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	01	2

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INSTRUCTION SHEET

RVTC

Tig Welding Equipment

1. Obtain from tool room:

   a. 1 - 2% thoriated tungsten electrode (3/32" diameter)
   b. 1 - 3/32" collet
   c. 1 - 3/32" gas lens collet body
   d. 1 - NO. 7 ceramic nozzle
   e. 1 - gas lens insulator

CAUTION: CHECK TO BE SURE ITEMS A, B AND C ARE ALL SIZE 3/32"!

2. Take equipment to a cyber tig welding machine.

CAUTION: DOUBLE CHECK TO BE SURE THAT HANDLE ON MAIN ELECTRICAL BOX FOR WELDING MACHINE IS IN "OFF" POSITION!

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	F	01	2

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ENABLING OBJECTIVE NO. 2

RVTC

Assemble tig torch and prepare equipment for gas tungsten arc welding

LEARNING STEPS

1. Read and view Resource No. 1 to identify steps in gas tungsten arc welding preparation.
2. Read Resource No. 2 to determine how to assemble the tig torch and prepare equipment.
3. Assemble torch and prepare machine for welding by following instructions in Resource No. 2.
4. When completed, evaluate your work using the Self-Check.

   Have instructor check your work.
5. When you think you can attain this task, take the Written Test.
6. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. a. PAT Workbook Topics 1 and 3; Job Practice -- Gas Tungsten Arc Welding, pages 5-9.
   b. Beseler Cue See; Topics 1 and 3.
2. Instruction Sheet enclosed, Assembling Torch and Preparing Machine
3. a. Cyber tig weld machine
   b. HW-18 tig torch
   c. Torch components
4. a. Self-Check enclosed.
   b. Instructor
5. Written Test for task F-01.
6. Performance Test for task F-01

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	01	3

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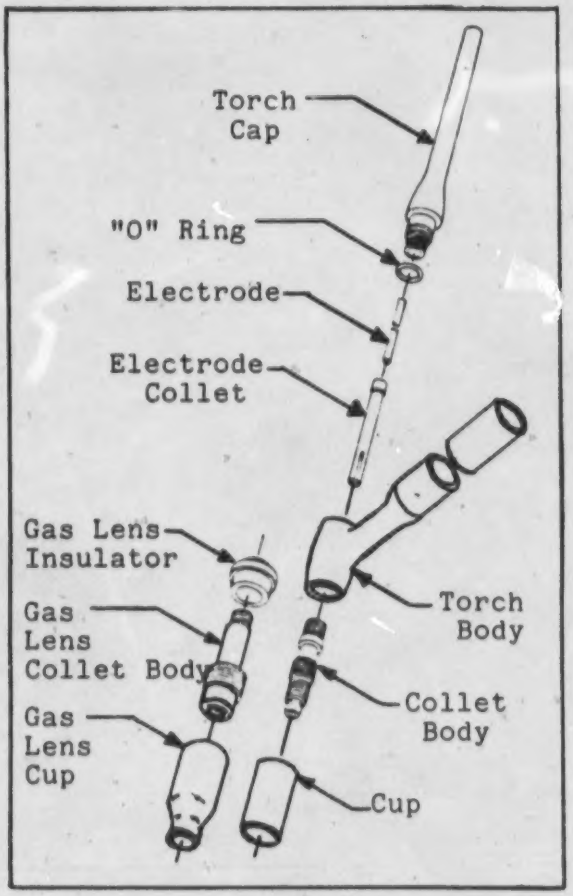
INSTRUCTION SHEET

RVTC

Assembling Torch and Preparing Machine



Exploded View of HW-18 Torch

CAUTION: MAKE SURE THAT HANDLE ON MAIN ELECTRICAL BOX FOR WELDING MACHINE IS IN "OFF" POSITION!

1. Assemble HW-18 torch:

   a. Assemble insulator on gas lens collet body and screw collet body into torch, finger tight only.

   b. Remove torch cap.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	F	01	3

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INSTRUCTION SHEET

RVTC

c. Slide collet into position (tapered end first).

d. Screw on ceramic cup.

e. Slip electrode through hole in collet until end extends beyond ceramic cup by approximately ¼".

CAUTION: BE SURE COLOR CODE END OF ELECTRODE IS ON TORCH CAP SIDE OF TORCH!

f. Screw on torch cap making sure "O" ring is in proper position. Tighten by hand only until electrode is secure.

2. Prepare machine for welding:

a. Set polarity switch for DCSP.

b. Set high frequency switch for "automatic".

c. Set high frequency dial on 30.

d. Set post purge dial on 3.

e. Set hot start dial on 2.

f. Set amperage range switch on 0-100.

g. Set amperage fine control on 9-80.

h. Set remote control switch to "on" position.

i. Slowly open cylinder valve. When gage indicator stops, open valve completely.

CAUTION: STAND TO SIDE OF GAGE WHEN OPENING!

j. Place torch where it will not arc.

k. Place main electrical switch in "on" position and turn power switch on machine to "on".

l. Step on remote foot control and release to start shielding gas flow.

m. Adjust flowmeter rate to 15 to 20 cubic feet per hour.

n. Turn off machine and call your instructor.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	F	01	3

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items must receive a "yes" response.

	YES	NO
1. Is the machine set for DCSP?.....	___	___
2. Is the color code end of electrode in the torch cap end of the torch?.....	___	___
3. Is high frequency switch on "automatic"?.....	___	___
4. Is amperage range switch set for 0-100 amps?.....	___	___
5. Is insulator on gas lens collet body?.....	___	___

If you received a "no" response for any item go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	F	01	3

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WRITTEN TEST FOR TASK NO. F-01

RVTC

TASK:	Assemble Tig Torch and Prepare to Gas Tungsten Arc Weld

IN-9943-F-01

Directions

The purpose of this test is to determine if you fully understand how to assemble a tig torch and prepare equipment for gas tungsten arc welding. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. Thoriated tungsten electrodes are used to weld steel and stainless steel.
2. A pure tungsten electrode is color coded "red".
3. Gas tungsten arc welding (GTAW) is commonly known as tig welding.
4. Argon is more commonly used as a shielding gas because being heavier, it provides a better shield.
5. The melting point of the tungsten electrode is 2800.
6. Pure tungsten electrodes are preferred for AC welding.
7. GTAW is very popular for welding thin gauge metals.
8. AC (alternating current) is used mainly for welding steel.
9. GTAW is not as difficult as metal arc welding.
10. GTAW is used to make top quality welds on almost all metals.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	01

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WRITTEN TEST FOR TASK NO. F-01

RVTC

TASK: Assemble Tig Torch and Prepare to Gas Tungsten Arc Weld

ANSWER KEY

Multiple Choice questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

True-False questions

(T)	F	1.	(T)	F	6.	T	F	11.	T	F	16.	T	F	21.
T	(F)	2.	(T)	F	7.	T	F	12.	T	F	17.	T	F	22.
(T)	F	3.	T	(F)	8.	T	F	13.	T	F	18.	T	F	23.
(T)	F	4.	T	(F)	9.	T	F	14.	T	F	19.	T	F	24.
T	(F)	5.	(T)	F	10.	T	F	15.	T	F	20.	T	F	25.

Matching questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	01

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PERFORMANCE TEST FOR TASK NO. F-01 RVTC

IN-9943-F-01

TASK: Assemble Tig Torch and Prepare to Gas Tungsten Arc Weld

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given all equipment, you will assemble an HW-18 tig torch and prepare the welding machine for gas tungsten arc welding.
Based upon the items below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Was the welding machine set for DCSP?		
2.	Was the flowmeter set for 15-20 CFPH?		
3.	Was high frequency switch set for automatic?		
4.	Was amperage range switch set on 0-100?		
5.	Did the electrode extend beyond the nozzle approximately 1/4"?		
6.	Were all connections on the torch only hand tight?		
7.	Was the remote control switch set in "on" position?		
8.	Was torch placed where it would not arc if machine was turned on?		

Score _____ ☐ ATTAINED ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	F	01		Page 1 of 1

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IN-9943-F-02

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Mild Steel With Tig Equipment
DUTY:	Operating Gas Shielded Arc Welding Equipment

PURPOSE:

Tig (tungsten inert gas) welding is used extensively to weld a variety of metals (aluminum, magnesium, stainless steel, nickel, etc.). It is especially popular for welding thin gauge metals. Competency in this task will help you attain the tasks that follow.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	F	02	F-01

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: tig welding equipment, tools, materials and a work station,

YOU WILL: setup and weld a series of weld joints with mild steel.

HOW WELL: You must successfully complete the Written Test.
Your performance will be assessed by your instructor using the Performance Test on page 10.

ENABLING OBJECTIVES:

1. Weld stringer beads in flat position with and without filler metal.
2. Weld lap joint with filler metal.
3. Weld tee joint with filler metal.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	02

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ENABLING OBJECTIVE NO. 1

RVTC

Weld stringer beads in flat position with and without filler metal.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to run stringer beads with or without filler metal.
2. Practice running weld beads without filler metal by following the steps in Resource No. 1.
3. When completed, evaluate your work using the Self-Check.
4. Practice running weld beads with filler metal by following the steps in Resource No. 1.
5. Go on to Enabling Objective No. 2.

RESOURCES

1. a. PAT Workbook-GTAW: Job Practice; topics 3-4, pages 8-13.
   b. Beseler Cue See: topic 14.
2. a. Work station
   b. Equipment
   c. Tools
   d. Materials: 1/16" x 2" x 8" mild steel pieces.
   e. Instructor
3. Self-Check enclosed.
4. a. Work station
   b. Equipment
   c. Tools
   d. Materials: 1/16" x 2" x 8" mild steel pieces.
   e. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	02	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
1. Were the weld beads approximately one electrode diameter wide?.....	___	___
2. Were the faces of the weld beads flat or slightly convex?.....	___	___
3. Were the weld ripples uniform indicating a constant travel speed?.....	___	___
4. Were the weld beads full without undercut on edges?.....	___	___
5. Was there evidence of a small bead on the back side of the plate?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	F	02	1

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ENABLING OBJECTIVE NO. 2

RVTC

Weld lap joint with filler metal.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to tig weld lap joints with filler metal.
2. Practice tig welding lap joints with filler metal by following instructions in Resource No. 1.

   Have instructor check your work.
3. Read Resource No. 3 and compare your welds to the illustrations.
4. When completed, evaluate your work using the Self-Check.
5. Go on to Enabling Objective No. 3.

RESOURCES

1. a. PAT Workbook-GTAW: Job Practice; Topic 5, pages 14-16.
   b. Beseler Cue See; Topic 5.
2. a. Work station
   b. Equipment
   c. Tools
   d. Materials: 1/16" x 2" x 8" mild steel pieces.
   e. Instructor
3. PAT Workbook-GTAW: Job Practice; Topic 6, pages 18-19.
4. Self-Check enclosed.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	02	2

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
1. Were the welds full to top edge of upper plate without undercut?.....	___	___
2. Were the weld beads approximately one electrode diameter wide?.....	___	___
3. Were the weld ripples uniform?.....	___	___
4. Did the welds show good fusion into bottom plate?.....	___	___
5. Were all joints welded on both sides of the plates?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	F	02	2

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ENABLING OBJECTIVE NO. 3

RVTC

Weld tee joint with filler metal.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to tig weld tee joints with filler metal.
2. Practice tig welding tee joints by following instructions in Resource No. 1.

   Have instructor check your work.
3. When you think you can attain this task, take the Written Test.
4. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. a. PAT Workbook-GTAW: Job Practice; topic 8, pages 25-27.
   b. Beseler Cue See; topic 8.
2. a. Work station
   b. Equipment
   c. Tools
   d. Materials: 1/16" x 2" x 8" mild steel pieces.
   e. Instructor
3. Written Test for task F-02.
4. Performance Test for task F-02.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	02	3

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WRITTEN TEST FOR TASK NO. F-02

RVTC

IN-9943-F-02

TASK: Weld Mild Steel With Tig Equipment

Directions

The purpose of this test is to determine if you understand how to weld mild steel with tig equipment. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle the T if the item is True and the F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. The electrode end should be round and shiny to tig weld mild steel.
2. A 1% or 2% thoriated tungsten electrode is correct for tig welding mild steel.
3. The high frequency switch should be on continuous for tig welding mild steel.
4. The shielding gas flow rate should be 15-20 cubic foot hours.
5. The electrode should stick out beyond the torch nozzle approximately two electrode diameters.
6. Direct current reverse polarity (DCRP) is used to tig weld mild steel.
7. The shielding gas post flow time should be long enough to prevent oxidation of the electrode.
8. If the electrode becomes contaminated, you should stop welding and reshape it.
9. Holding too long an arc length or not properly cleaning the base metal can cause porosity in the weld deposit.
10. Contamination of the electrode is caused by touching it to the weld puddle or the filler metal.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	02

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WRITTEN TEST FOR TASK NO. F-02

RVTC

IN-9943-F-02

TASK: Weld Mild Steel With Tig Equipment

ANSWER KEY

Multiple Choice questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

True-False questions

T (F) 1.	T (F) 6.	T F 11.	T F 16.	T F 21.
(T) F 2.	(T) F 7.	T F 12.	T F 17.	T F 22.
T (F) 3.	(T) F 8.	T F 13.	T F 18.	T F 23.
(T) F 4.	(T) F 9.	T F 14.	T F 19.	T F 24.
(T) F 5.	(T) F 10.	T F 15.	T F 20.	T F 25.

Matching questions

___1.	___6.	___11.	___16.	___21.
___2.	___7.	___12.	___17.	___22.
___3.	___8.	___13.	___18.	___23.
___4.	___9.	___14.	___19.	___24.
___5.	___10.	___15.	___20.	___25.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	02

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PERFORMANCE TEST FOR TASK NO. F-02

RVTC

IN-9943-F-02

TASK:	Weld Mild Steel with Tig Equipment

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given a work station, tools, tig welding equipment and four pieces 1/16" x 2" x 8" mild steel; you will setup and tig weld two lap joints and one tee fillet. You will be evaluated for attainment of this task, based upon the items listed below.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Were all weld joints securely tackwelded?		
2.	Were the lap welds full without undercutting?		
3.	Were the lap weld faces flat or slightly convex?		
4.	Were the weld bead ripples uniform?		
5.	Were the leg lengths of the tee fillet weld equal?		
6.	Was there an absence of burn-through on the vertical plate?		
7.	Was the weld face full or slightly convex?		
8.	Were the welds free of porosity?		

Score _____ ☐ ATTAINED ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	F	02		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-F-03

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Stainless Steel With Tig Equipment
DUTY:	Operating Gas Shielded Arc Welding Equipment

PURPOSE:

The Tig process is used extensively to weld thin gauge stainless steel. This Learning Guide will help you attain the skills to become competent in this task.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	F	03	F-02

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, metal and a work station,

YOU WILL: setup and tig weld a series of joints on stainless steel.

You must successfully complete the Written Test.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 8.

ENABLING OBJECTIVES:

1. Tig weld lap joint: stainless steel.
2. Tig weld tee joint: stainless steel.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	03

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ENABLING OBJECTIVE NO. 1

RVTC

Tig weld lap joint: stainless steel.

LEARNING STEPS

1. Read Resource No. 1 to acquire a background of stainless steel.
2. Read Resource No. 2a and view Resource No. 2b to determine how to tig weld a lap joint with stainless steel.
3. Practice welding lap joints by following directions in Resource No. 1.
4. When completed, evaluate your work using the Self-Check.

   Have instructor check your work.
5. Go on to Enabling Objective No. 2.

RESOURCES

1. PAT Workbook-GTAW; Job Practice, topic 15, pages 54-55.
2. a. PAT Workbook-GTAW; Job Practice, topic 14, pages 50-53.
   b. Beseler Cue See; topic 14.
3. a. Work station
   b. Tools
   c. Equipment
   d. Material:
      a. 1/16" x 2" x 8" stainless steel.
      b. 1/16" diameter stainless weld wire.
4. a. Self-Check enclosed.
   b. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	03	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
1. Were the finished weld beads approximately one electrode diameter wide?.....	___	___
2. Were the weld bead faces flat or slightly convex?.....	___	___
3. Were the weld ripples uniform?.....	___	___
4. Was there an absence of undercut?.....	___	___
5. Did the weld beads have a rainbow or copper color?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	F	03	1

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ENABLING OBJECTIVE NO. 2

RVTC

Tig weld tee joint: stainless steel.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to tig weld a tee joint with stainless steel.
2. Practice welding tee joints by following directions in Resource No. 1.
3. When you think you can attain this task, take the Written Test.
4. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. a. PAT Workbook-GTAW; Job Practice: topic 18; pages 58-59.
   b. Beseler Cue See, Topic 18
2. a. Work station
   b. Tools
   c. Equipment
   d. Material:
      a. 1/16" x 2" x 8" stainless steel
      b. 1/16" diameter stainless weld wire
3. Written Test for task F-03.
4. Performance Test for task F-03.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	03	2

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WRITTEN TEST FOR TASK NO. F-03

RVTC

IN-9943-F-03

TASK: Weld Stainless Steel With Tig Equipment

Directions

The purpose of this test is to determine if you fully understand how to weld stainless steel with tig equipment. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are True-False. On the separate Answer Sheet, circle the T if the item is True and the F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. The 300 series stainless steels are often called 18-8 stainless because they contain 18% chromium and 8% nickle.
2. It is not necessary to clean stainless steel before welding.
3. The high expansion rate of stainless steel may cause distortion, especially in thin guage metal.
4. Stainless steel cannot be drilled or machined.
5. Too much welding heat can cause loss of corrosion resistant properties.
6. Compared to mild steel, a lower amperage is used to weld stainless steel.
7. Proper amperage, travel speed and shielding gas flow rate will produce a weld bead that is rainbow or copper colored.
8. An erratic or uneven travel speed may cause open defects and incomplete fusion.
9. It is not necessary to tackweld the joints in stainless before welding.
10. Stainless steels are relatively easy to weld if proper procedures are followed.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	03

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WRITTEN TEST FOR TASK NO. F-03

RVTC

TASK: Weld Stainless Steel With Tig Equipment

ANSWER KEY

Multiple Choice questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

True-False questions

(T) F 1.	(T) F 6.	T F 11.	T F 16.	T F 21.
T (F) 2.	(T) F 7.	T F 12.	T F 17.	T F 22.
(T) F 3.	(T) F 8.	T F 13.	T F 18.	T F 23.
T (F) 4.	T (F) 9.	T F 14.	T F 19.	T F 24.
(T) F 5.	(T) F 10.	T F 15.	T F 20.	T F 25.

Matching questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	03

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PERFORMANCE TEST FOR TASK NO. F-03

RVTC

IN-9943-F-03

TASK:	Weld Stainless Steel with Tig Equipment

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: At a school work station, you will weld a series of stainless stell lap and tee joints with tig equipment. You will be evaluated for attainment of this task, based upon the items listed below.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Were the welds free of porosity and undercut?		
2.	Were the tee joints free of burn-through on the vertical plate?		
3.	Were the weld faces flat or slightly convex?		
4.	Did the welds have a rainbow or copper colored appearance?		
5.	Was the weld ripple uniform?		
6.	Were the welds approximately 1 - 1½ electrode diameters wide?		
7.	Did the welds have good fusion with the base metal?		
8.	Was distortion held to a minimum?		

☐ ATTAINED

Score _____ ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	F	03		Page 1 of 1

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VO-TECH CENTER

7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-F-04

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Aluminum with Tig Equipment
DUTY:	Operating Gas Shielded Arc Welding Equipment

PURPOSE:

Aluminum is a metal which is commonly welded using the tig and mig processes. This Guide will help you become proficient in welding aluminum using the tig process.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	F	04	F-01

REVISED				

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, materials and a work station,

YOU WILL: weld various weld joints on aluminum using the tig process.

HOW WELL: You must successfully complete the Written Test.
Your performance will be assessed by your instructor using the Performance Test on page 10.

NOTE:
IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Weld lap joints: flat position
2. Weld tee joints: flat and vertical positions
3. Weld butt joints: flat position

DEPT.	PROG.	DUTY	TASK
IN	9943	F	04

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ENABLING OBJECTIVE NO. 1

RVTC

Weld lap joints: flat position.

LEARNING STEPS

1. Read Resource No. 1 to recognize the welding characteristics of aluminum.
2. Read Resource No. 2a and view Resource No. 2b to determine how to tackweld and weld lap joints.
3. Practice tackwelding and welding lap joints by following the steps in Resource No. 2.
4. When completed, evaluate your work using the Self-Check.

   Have instructor check your work.
5. Go on to Enabling Objective No. 2.

RESOURCES

1. PAT Workbook -- GTAW; Topic 22, pages 71-73.
2. a. PAT Workbook -- Topic 23; Job Practice, pages 74-77.
   b. Beseler Cue See; Topic 23.
3. a. Work station
   b. Equipment
   c. Material: 5 pieces 1/8" x 2" x 4" aluminum
   d. 3/32" x 36" aluminum welding wire
4. a. Self-Check enclosed
   b. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	04	1

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SELF-CHECK

RVTC

Directions

Evaluate your work using the items below.

All items should receive a "yes" response.

		YES	NO
1.	Were the weld joints filled completely and slightly convex?	____	____
2.	Were the welds free of undercut?	____	____
3.	Were the weld beads approximately three electrode diameters wide (1/4" to 3/8")?	____	____
4.	Did the weld beads penetrate the base metal without melting through?	____	____
5.	Were the craters filled at the ends of the weld beads?	____	____
6.	Was the surface ripple of the weld beads uniform?	____	____
7.	Did the welds have a clean, bright appearance?	____	____

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG	DUTY	TASK	EN. OBJ.
IN	9943	F	04	1

ENABLING OBJECTIVE NO. 2

RVTC

Weld tee joints: flat and vertical positions.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to tackweld and weld tee joints: flat position.
2. Practice tackwelding and welding tee joints by following the steps in Resource No. 1.
3. When completed, have instructor check your work.
4. Read Resource No. 4a and view Resource No. 4b to determine how to tackweld and weld tee joints: vertical position.
5. Practice tackwelding and welding tee joints by following the steps in Resource No. 4.
6. When completed, have instructor check your work.
7. Go on to Enabling Objective No. 3.

RESOURCES

1. a. PAT Workbook -- GTAW: Topic 25; Job Practice, pages 81-83.
   b. Beseler Cue See; Topic 25.
2. a. Work station
   b. Equipment
   c. Materials: 5 pieces 1/8" x 2" x 4" aluminum
   d. 3/32" x 36" aluminum welding wire
3. Instructor
4. a. PAT Workbook -- GTAW: Topic 27; Job Practice, pages 87-88.
   b. Beseler Cue See; topic 25
5. a. Work station
   b. Equipment
   c. Materials: 5 pieces 1/8" x 2" x 4" aluminum
   d. 3/32" x 36" aluminum welding wire
6. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	04	2

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ENABLING OBJECTIVE NO. 3

RVTC

Weld butt joints: flat position.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to tackweld and weld butt joints: flat position.
2. Practice tackwelding and welding butt joints by following the steps in Resource No. 1.
3. When completed, have instructor check your work.
4. When you think you can perform this task, take the Written Test.
5. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. a. PAT Workbook -- GTAW: Topic 21; Job Practice, pages 69-70.
   b. Beseler Cue See; Topic 21.
2. a. Work station
   b. Equipment
   c. Materials: 5 pieces 1/8" x 2" x 4" aluminum
   d. 3/32" x 36" aluminum welding wire
3. Instructor
4. Written Test for Task F-04
5. Performance Test for Task F-04.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	F	04	3

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WRITTEN TEST FOR TASK NO. F-04

RVTC

IN-9943-F-04

TASK: Weld Aluminum with Tig Equipment

Directions

The purpose of this test is to determine if you fully understand how to weld lap, tee, and butt joints on aluminum using the tig process. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities, or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. The oxide film on the surface of aluminum has a melting point approximately three times higher than the melting point of the aluminum.
2. A stainless steel wire brush should be used to clean the surface of aluminum before welding.
3. The welding of aluminum should be performed as quickly as possible after cleaning the surface.
4. A lower heat imput (amperage) is used to weld aluminum than is used for the same thickness of stainless steel.
5. When welding aluminum, the molten puddle will be a red or orange color.
6. As the weld progresses, it is normally necessary to reduce the welding current or increase travel speed to prevent excessive penetration.
7. If a white line appears along each edge of the weld, it indicates that the surface oxide has not been cleaned by the arc.
8. A dark weld indicates that not enough shielding gas is being used or that the surface oxide was not completely cleaned
9. On a lap weld, the correct travel speed should produce a weld bead the same width as the electrode diameter.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	04

cont.

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WRITTEN TEST FOR TASK NO. F-04

RVTC

IN-9943-F-04

TASK:	Weld Aluminum with Tig Equipment

10. When welding a tee joint, a longer arc length will prevent the welding wire from melting ahead of the puddle.

11. It is necessary to add more welding wire when welding a tee joint than when welding a lap joint.

12. The shielding gas flow when welding 1/8" thick aluminum should be 20 CFH.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	04

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WRITTEN TEST FOR TASK NO. F-04

RVTC

TASK: Weld Aluminum with Tig Equipment

ANSWER KEY

Multiple Choice questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

True-False questions

(T) F 1.	(T) F 6.	(T) F 11.	T F 16.	T F 21.
(T) F 2.	T (F) 7.	(T) F 12.	T F 17.	T F 22.
(T) F 3.	(T) F 8.	T F 13.	T F 18.	T F 23.
T (F) 4.	T (F) 9.	T F 14.	T F 19.	T F 24.
T (F) 5.	T (F) 10.	T F 15.	T F 20.	T F 25.

Matching questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	F-04

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PERFORMANCE TEST FOR TASK NO. F-04 RVTC

IN-9943-F-04

TASK:	Weld Aluminum with Tig Equipment

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given standard tig welding equipment, aluminum plates and welding wire, you will weld a lap joint, tee joint and butt joint in the flat position and a tee joint in the vertical position. You will be evaluated for attainment of this task, based upon the items listed below.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Did the weld bead fuse to the upper plate without undercut on the lap weld?	....	....
2.	Was the bead width 1/4" to 3/8" wide on the lap weld?	....	....
3.	Was the tee joint (flat position) welded without undercutting the vertical plate?	....	....
4.	Was the tee joint (vertical position) welded without excess sag to the weld face?	....	....
5.	Did the butt weld have complete penetration without excess melt through?	....	....
6.	Did all welds have a uniform surface ripple?	....	....
7.	Were all welds clean and bright in appearance?	....	....
8.	Was there a white line along the edges of the welds?	....	....
9.	Were craters filled at the ends of the weld beads?	....	....

☐ ATTAINED

Score _____ ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	F	04		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-F-05

WELDING

A STUDENT LEARNING GUIDE

TASK:	Assemble Mig Torch and Prepare to Mig Weld
DUTY:	Operating Gas Shielded Arc Welding Equipment

PURPOSE:

The mig welding process is frequently used to weld mild steel, stainless steel and aluminum. This Learning Guide will familiarize the student with the equipment used to mig weld mild steel.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	F	05	

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, tools, materials and a work station,

YOU WILL: prepare the station for welding, strike arc and deposit bead and shut down station.

You must successfully complete the Written Test.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 7.

NOTE:

IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Prepare station for welding.
2. Strike arc, deposit bead and shut down station.

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IN	9943	F	05

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ENABLING OBJECTIVE NO. 1

RVTC

Prepare station for welding.

LEARNING STEPS

1. View Resource No. 1 to interpret the mig welding process.
2. View Resource No. 2 demonstrating the necessary steps to prepare to mig weld.
3. Prepare the work station for mig welding by following the steps in Resource No. 2.
4. Have instructor check your work station.
5. Go on to Enabling Objective No. 2.

RESOURCES

1. Beseler Cue See: GMAW, Topic 1.
2. Beseler Cue See; GMAW, Topic 3.
3. Work station
4. Instructor

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IN	9943	F	05	1

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ENABLING OBJECTIVE NO. 2

RVTC

Strike arc, deposit bead and shut down station.

LEARNING STEPS

1. View Resource No. 1 to determine how to strike arc, deposit weld bead and shut down station.
2. Practice striking arc and depositing weld beads by following the steps in Resource No. 1.
3. When completed, have instructor check your work.
4. Shut down work station by following the steps in Resource No. 1.

   Have instructor check your work.

RESOURCES

1. Beseler Cue See; GMAW, Topic 3
2. a. Work station
   b. Equipment
   c. Material: 2 pieces 3/16" x 3" x 8" mild steel
3. Instructor
4. a. Work station
   b. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	05	2

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WRITTEN TEST FOR TASK NO. F-05

RVTC

IN-9943-F-05

TASK: Assemble Mig Torch and Prepare to Mig Weld

Directions

The purpose of this test is to determine if you fully understand how to assemble mig torch and prepare to mig weld. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities, or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. A constant voltage welding machine is one in which the voltage remains the same regardless of the amount of amperage being used.
2. The speed of the wire feed determines the amount of amperage being used.
3. Three types of metal transfer can be used with mig welding; spray, globular and short circuit. In this course we are using the spray transfer type.
4. The mig welding process cannot be used for overhead welding.
5. The shielding gas used with mig welding has the same purpose as the coating on a metal arc electrode.
6. Mig welding is not as fast as metal arc welding.
7. Reverse polarity (work negative, electrode positive) is used for mig welding.
8. The shielding gas flow rate should be set at 20 CFH.
9. The voltage should be set for 25 volts.
10. Increasing the speed of the wire feed lowers the amperage being used.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	05

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WRITTEN TEST FOR TASK NO. F-05

RVTC

IN-9943-F-05

TASK: Assemble Mig Torch and Prepare to Mig Weld

ANSWER KEY

Multiple Choice questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

True-False questions

(T) F 1.	T (F) 6.	T F 11.	T F 16.	T F 21.
(T) F 2.	(T) F 7.	T F 12.	T F 17.	T F 22.
T (F) 3.	(T) F 8.	T F 13.	T F 18.	T F 23.
T (F) 4.	T (F) 9.	T F 14.	T F 19.	T F 24.
(T) F 5.	T (F) 10.	T F 15.	T F 20.	T F 25.

Matching questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	05

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PERFORMANCE TEST FOR TASK NO. F-05 | RVTC

IN-9943-F-05

TASK:	Assemble Mig Torch and Prepare to Mig Weld

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given standard mig welding equipment and metal plates, you will prepare to mig weld, deposit weld beads and shut down the work station. You will be evaluated for attainment of this task, based upon the items listed below.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Was the shielding gas flow rate set for 20 CFH?		
2.	Was the wire feed speed set so that 120 amperes were being used?		
3.	Was the voltage set for 19-21 volts?		
4.	Was the machine set for reverse polarity?		
5.	Did the student check the welding gun for splatter build-up in the nozzle?		
6.	While depositing the weld beads, did the student maintain 1/4" to 3/8" electrode wire stickout?		
7.	Did the student trim the electrode wire end before starting a new weld bead?		
8.	Did the student close the gas supply valve and bleed the hose when shutting down the station?		
9.	Did the student close the flow meter valve?		
10.	Did the student turn off the welding machine and wire feed assembly?		

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DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	F	05		Page 1 of 1

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9943-F-06

WELDING

A STUDENT LEARNING GUIDE

TASK:	Weld Mild Steel with Mig Equipment
DUTY:	Operating Gas Shielded Arc Welding Equipment

PURPOSE:

This Learning Guide will enable the student to develop the entry level skills necessary to mig weld mild steel.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9943	F	06	F-05

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: equipment, materials and a work station,

YOU WILL: weld mild steel with mig equipment.

HOW WELL: You must successfully complete the Written Test.
Your performance will be assessed by your instructor using the Performance Test on page 10.

NOTE:
IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Weld square groove and fillet welds: flat position.
2. Weld square groove and fillet welds: vertical down position.
3. Weld square groove and fillet welds: vertical up position.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	06

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ENABLING OBJECTIVE NO. 1

RVTC

Weld square groove and fillet welds: flat position.

LEARNING STEPS

1. Read Resource No. 1a and view Resource No. 1b to determine how to mig weld square groove and fillet welds: flat position.
2. Practice welding square groove and fillet welds in the flat position by following the steps in Resource No. 1.
3. Evaluate your work using the Self-Check.

   Have instructor check your work.
4. Go on to Enabling Objective No. 2.

RESOURCES

1. a. PAT Workbook -- GMAW: Topic 6; Job Practice, pages 17-23.
   b. Beseler Cue See -- GMAW; Topic 6.
2. a. Work station
   b. Equipment
   c. Material: 4 pieces 3/16" x 3" x 8" mild steel (makes 1 assembly)
3. a. Self-Check enclosed
   b. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	06	1

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SELF-CHECK

RVTC

Directions

Evaluate your work using the items below.
All items should receive a "yes" response.

	YES	NO
1. Did the butt welds have complete penetration?	____	____
2. Were the fillet welds free of undercut?	____	____
3. Did the tee fillet welds have equal leg lengths?	____	____
4. Were the weld faces slightly convex?	____	____

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	F	06	1

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ENABLING OBJECTIVE NO. 2

RVTC

Weld square groove and fillet welds: vertical down position.

LEARNING STEPS

1. Read Resource No. 1a and view Resource 1b to determine how to mig weld square groove and fillet welds: vertical down position.
2. Practice welding square groove and fillet welds in the vertical down position by following the steps in Resource No. 1.
3. Evaluate your work using the Self-Check.

   Have instructor check your work.
4. Go on to Enabling Objective No. 3.

RESOURCES

1. a. PAT Workbook -- GMAW: Topic 9; Job Practice, pages 31-35.
   b. Beseler Cue See -- GMAW; Topic 9.
2. a. Work station
   b. Equipment
   c. Material: 4 pieces 3/16" x 3" x 8" mild steel (makes 1 assembly)
3. a. Self-Check enclosed
   b. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	06	2

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SELF-CHECK

RVTC

Directions

Evaluate your work using the items below.

All items should receive a "yes" response.

	YES	NO
1. Was the penetration on the butt welds slightly concave to flush?	___	___
2. Were the fillet welds free of undercut?	___	___
3. Were the weld faces slightly convex?	___	___
4. Were the welds free of cold lap?	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9943	F	06	2

ENABLING OBJECTIVE NO. 3

RVTC

Weld square groove and fillet welds: vertical up position.

LEARNING STEPS

1. Read Resource No 1a and view Resource No. 1b to determine how to mig weld square groove and fillet welds: vertical up position.
2. Practice welding square groove and fillet welds by following the steps in Resource No. 1.
3. Have instructor check your work.
4. When you think you can perform this task, take the Written Test.
5. When you successfully complete the Written Test, take the Performance Test.

RESOURCES

1. a. PAT Workbook -- Topic 10; Job Practice, pages 36-39.
   b Beseler Cue See -- GMAW; Topic 10.
2. a. Work station
   b. Equipment
   c. Material: 4 pieces 3/16" x 3" x 8" mild steel (makes 1 assembly)
3. Instructor
4. Written Test for Task F-06.
5. Performance Test for Task F-06.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9943	F	06	3

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WRITTEN TEST FOR TASK NO. F-06

RVTC

IN-9943-F-06

TASK: Weld Mild Steel with Mig Equipment

Directions

The purpose of this test is to determine if you fully understand how to weld square groove and fillet welds on mild steel using the mig process. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities, or retesting.

The items below are True-False. On the separate Answer Sheet, circle T if the item is True and F if the item is False.

DO NOT MARK ON THIS TEST!

True-False questions

1. More amperage is required to weld vertical up than for vertical down.
2. When welding a butt joint, you should keep the welding wire directed at the leading edge of the weld puddle.
3. When welding vertical down, you should hold a travel angle of 10° - 20° drag.
4. The root opening and amperage are not important when welding a butt joint vertical up.
5. A slight weaving motion is necessary when making a fillet weld vertical up.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	06

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WRITTEN TEST FOR TASK NO. F-06

RVTC

IN-9943-F-06

TASK: Weld Mild Steel with Mig Equipment

ANSWER KEY

PAGE 1 OF 1

Multiple Choice questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

True-False questions

T (F) 1.	T F 6.	T F 11.	T F 16.	T F 21.
(T) F 2.	T F 7.	T F 12.	T F 17.	T F 22.
(T) F 3.	T F 8.	T F 13.	T F 18.	T F 23.
T (F) 4.	T F 9.	T F 14.	T F 19.	T F 24.
(T) F 5.	T F 10.	T F 15.	T F 20.	T F 25.

Matching questions

____1.	____6.	____11.	____16.	____21.
____2.	____7.	____12.	____17.	____22.
____3.	____8.	____13.	____18.	____23.
____4.	____9.	____14.	____19.	____24.
____5.	____10.	____15.	____20.	____25.

DEPT.	PROG.	DUTY	TASK
IN	9943	F	06

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PERFORMANCE TEST FOR TASK NO. F-06 RVTC

IN-9943-F-06

TASK:	Weld Mild Steel with Mig Equipment

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given standard mig welding equipment, materials and a work station, you will weld a series of square groove and fillet welds in the flat, vertical up and vertical down position. You will be evaluated for attainment of this task, based upon the items listed below.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
1.	Did the square groove welds have complete but not excessive penetration?		
2.	Were the fillet welds free of undercut?		
3.	Were the weld faces slightly convex?		
4.	Were the welds free of cold lap?		
5.	Did the tee fillet welds have equal leg lengths?		

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DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9943	F	06		Page 1 of 1

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